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## IN THIS ISSUE

Editorial Page ..... 17

Heavy Attendance and Interesting Technical Papers Feature I. A. A. Meeting ..... 19

Morehead Medal to H. Sidney Smith ..... 23

Review of Progress in the Oxy-Acetylene Industry ..... 24

An Attempt to Define the Job of Welding Engineer ..... 28

Pioneer Application of Low-Temperature Alloy For Brazing Copper Bus-Bars ..... 34

Welding—The Major Tool of Industry ..... 36

New Equipment Developments ..... 42

News of the Industry ..... 44

Armour Institute of Technology Series of Welding Lectures ... 27
How to Handle Grievances ... 31
Welding Plays Important Role In Cement Plants ... 31
Newest of Stainless Steel Streamlined Trains ... 32
Get H. O. T. on Welding ... 33
Cutting Down Truck or Tractor Wheels for Pneumatic Tires ... 39
New Equipment Developments ... 42
News of the Industry ... 44
Construction News ... 45
A. W. S. Activities ... 45
Foreign News ... 46
Trade News ... 49
Trade Literature ... 50
Obituary ... 52
Classified Section ... 53

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# INDEX TO ADVERTISERS


**A**

Air Reduction Sales Co. ..... 16
Adams & Co., J. D. ..... 48
American Agile Corp. ..... 57
American Brass Co. ..... 47
American Steel & Wire Co. ..... 8
American Welding Society ..... 14
Anti-Borax Compound Co. ..... 58
Arcos Corp. ..... 58

**B**

Bastian-Blessing Co., The ..... 6

**C**

Central Steel & Wire Co. ..... Third Cover
Chicago Hardware Foundry Co. ..... 55
Chicago Steel & Wire Co. ..... 56
Classified Ads ..... 53
Cleveland Pneumatic Tool Co. ..... 50
Cleveland School of Welding, Inc. ..... 53
Columbia Steel Co. ..... 8

**E**

Eisler Engineering Co. ..... 58
Electric Arc Cutting & Welding Co. ..... Fourth Cover

**G**

General Electric Co. ..... 9

**H**

Handy & Harman ..... 51
Harnischfeger Corp. ..... 11
Hobart Brothers ..... 3

**I**

Ideal Face Shield Co. ..... 58

**J**

Jackson Electrode Holder Co. ..... Third Cover

**L**

Lincoln Electric Co., The ..... 7

**M**

Metal & Thermit Corp. ..... 18
Metal-Bond Mfg. Co. ..... 58
Metallizing Company of America, Inc. ..... 10
Miami Hotel ..... 57
Milburn Co., The Alexander ..... 58

**N**

National Carbide Corp. ..... 54
Northeast Metals Co. ..... 58

**O**

Okonite Co., The ..... 49
Owen Electric Sales Co. ..... 53

**P**

Pierce Governor Co. ..... 57
Pratt & Whitney ..... 12

**R**

Reid-Avery Co., Inc. ..... Second Cover
Revere Copper & Brass, Inc. ..... 55
Roeblings Sons Co., J. A. ..... 4
Ryerson & Sons, Inc., Jos. T. ..... 52

**S**

Safety Gas Lighter Co. ..... 52
Steel Sales Corp. ..... 54
Steiner Oven Co. ..... 56
Stoody Co. ..... 55
Stulz-Sickles Co. ..... 54

**T**

Torchweld Equipment Co. ..... 57

**U**

U. S. Steel Products Co. ..... 8

**V**

Victor Equipment Co. ..... 15

**W**

Westinghouse Electric & Mfg. Co. ..... 13

# The Christmas Spirit

IT IS OUR SINCEREST WISH that all of our friends—our readers, advertisers and those who now and then give us a friendly boost, as well as those who do not—enjoy a Merry Christmas and that the New Year will bring to them a full measure of happiness. The Yuletide spirit which makes its perennial appearance at the close of the year has many social implications. It is undoubtedly the outstanding example of mass psychology based on a very fundamental human emotion. Merchandising experts have played upon this basic emotion, sometimes too selfishly perhaps, but none the less we feel that the net result of all the advertising and merchandising pressure exerted prior to Christmas has a very beneficial effect. It is particularly appropriate at this time because of the current recession in activity throughout the heavy metal industries.

In keeping with the spirit of the season, we are glad to greet our readers with a new typographical format. We hope that our readers will react favorably to our new editorial appearance. We have achieved this new style with the help of the creative talents of a printer who has diligently exerted himself to help *The Welding Engineer* put its best foot forward. First impressions are always important. That is why manufacturers of packaged goods devote a great deal of attention to the appearance and style of their package designs.

★

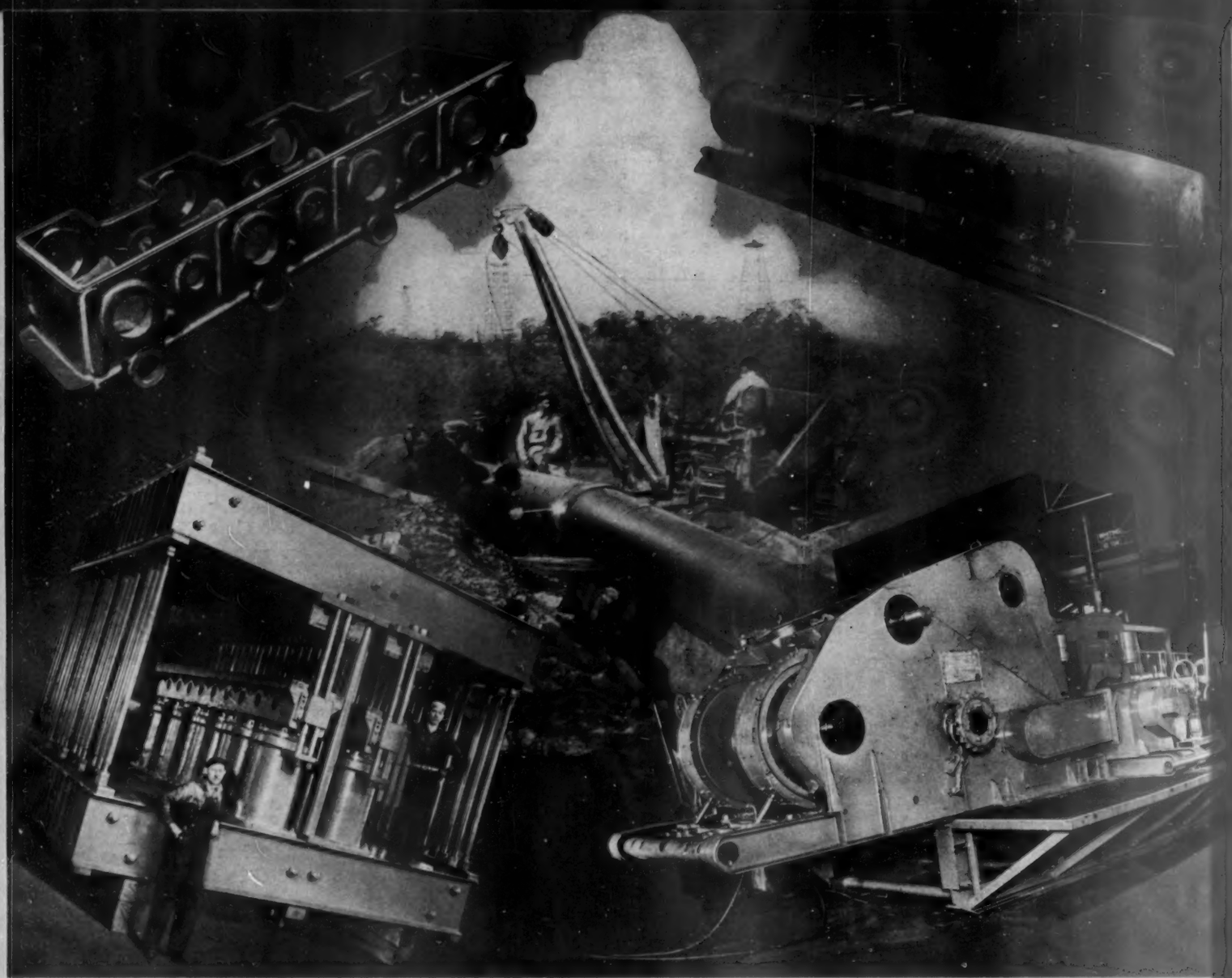
# Handling Grievances

AMONG THE TREMENDOUS PILE of mail which lands on the editor's desk every day, it was our good fortune recently to run across a small booklet entitled "How to Handle Grievances", written by Glenn Gardiner. The author holds a responsible executive position in the woolen industry, and has been trained from the bottom up. He knew the backaches of hard manual labor before he climbed up the ladder to a point where he became acquainted with the "headaches" of executive responsibility.

Just recently Alfred P. Sloan, Jr., chairman of General Motors Corporation, donated an additional 10 million dollars worth of securities to the Alfred P. Sloan Foundation, the purpose of which, according to Mr. Sloan, is the "promotion of a wider knowledge of basic economic truths generally accepted as such by authorities of recognized standing and as demonstrated by experience, as well as a better understanding of economic problems in which we are today so greatly involved and as to which we are so importantly concerned. All will agree as to the importance such matters are now assuming in the public consciousness."

It is particularly appropriate at this time, therefore, to have such a compact little booklet available detailing for the executive some of the problems involved in the handling of employee grievances. An accumulation of small irritations and aggravations which are neglected by management can finally swell up and burst out explosively. On page 31 of this issue we refer to the author's book and quote from its introduction so that our readers may know more about it. We quote below just a few of the situations which create dissatisfactions in industry and are at the bottom of most of the misunderstanding which creates bad feeling. We feel reasonably sure that the experience of men in the welding industry will substantiate the sound practical basis of these situations pointed out by Mr. Gardiner:

Cutting of piece rates when "men run away with the rates"
Giving orders without giving reasons
Favoritism
Relatives working under a foreman
Blaming workers unfairly
Surly, hard-boiled or rough supervision
Bawling out workers before others
Inadequate instructions leading to mistakes
Taking undue advantage of a worker's need for his job
Putting men on jobs for which they are not fitted



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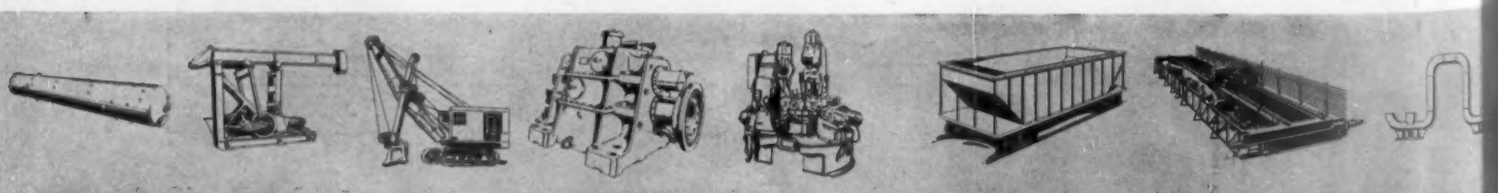

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C. O. Epperson (center), director and past president of the I. A. A. awarding the Morehead Medal to H. Sidney Smith (left) —President C. D'W. Gibson (right) of the I. A. A. looks on.

Heavy attendance and timely importance of technical papers feature

# I.A.A. Meeting at Birmingham

★ Developments in oxy-acetylene industry reviewed — Flame cutting and flame hardening covered in excellent papers — Round table discussions again prove to be popular

THE 38TH ANNUAL CONVENTION of the International Acetylene Association, held in Birmingham, Ala., November 10th, 11th, and 12th, was one of the outstanding meetings in the history of the association. This was true not only in terms of the total attendance of over twenty-nine hundred, but also because of the timely importance of the subjects discussed and the high caliber of the engineering experts who presented the various papers at the technical sessions and who assisted at the round table discussions.

J. L. Perry, president, Tennessee, Coal, Iron & Railroad Co., Birmingham, presented the address of welcome as part of the program planned for the opening luncheon at the Tutwiler Hotel on Wednesday, November 10th. Of particular interest to members of the I.A.A. was the fact that Mr. Perry has followed the growth of the acetylene industry since its inception. On January 1, 1938, Mr. Perry will become president of the Carnegie-Illinois Steel Corp.

Dr. James Shelby Thomas, president, Chrysler Institute of Engineering, Detroit, delivered the keynote address at the opening luncheon. His subject "New Frontiers for Smart People" outlined in brilliant style the objectives of all business activity and pointed out some of the social problems presented by the acquisition of more leisure by millions of men who formerly worked longer hours. His talk was interspersed with many humorous anecdotes. One that probably stands out above all of them was his classical definition of a high-brow—"a man who has been educated beyond his capacity to assimilate."

In his address at the opening luncheon, President C. D'W. Gibson reviewed the activity of the association during the 38 years of its existence and emphasized the tremendous importance of the acetylene industry in our present industrial society. In order to do this he presented statistics on the magnitude of the industry and particularly the rapid growth of the oxy-acetylene process. Mr. Gibson's address is abstracted elsewhere in this issue.

### Morehead Medal

A highlight of the opening luncheon was the presentation of the Morehead Medal to H. Sidney Smith, New York, "for his vision, inspirational guidance and aggressive cooperation in the advancement of the acetylene industry." Since Mr. Smith has also recently been announced as the recipient of the Samuel Wylie Miller Medal awarded by the American Welding Society, he thus becomes the first man ever to receive the two outstanding awards of the welding industry.

At the annual luncheon and business meeting Thursday, November 11th, Dr. G. V. Slottman, chairman of the Oxy-Acetylene Committee, presented its annual report. This was a comprehensive review of the scope of the oxy-acetylene industry in 1937. Dr. Slottman's report is published elsewhere in these pages.

J. I. Banash, consulting engineer of the Association, presented his annual report, detailing his activities in the

There was an overflow into the balcony of the Tutwiler Hotel at the opening luncheon.

interest of safety and fire prevention. Through his efforts the acetylene industry has been able to develop, to increase its usefulness, and to progress to become one of the safest industries in the country. His work has tied in very closely with that of the Legislative Committee headed by H. Sidney Smith in obtaining recognition and acceptance of the oxy-acetylene process and in fostering codes and legislation to provide for its broad use throughout industry.

### New Officers Elected

Elmer H. Smith of the Commercial Gas Co., Minneapolis, was elected president of the I.A.A. for 1938 at the annual luncheon and business meeting. The other officers elected are: Vice President, H. P. Dolisie, Canadian Liquid Air Co. Ltd., Montreal; secretary, H. F. Reinhard, Union Carbide Co., New York; treasurer, Henry Booth, Shawinigan Products Corp., New York.

The technical sessions held on Wednesday, Thursday and Friday afternoons were each attended by three- to four-hundred members and guests of the association. A feature of the first session on "Speeding Manufacture and Construction With Oxy-Acetylene Welding" was a number of papers on pipe welding which held much interest both from the technical and supervisory viewpoints. The second session on "How and Why to Use Oxy-Acetylene Cutting" also was received enthusiastically, because of the many new developments in machine cutting during the past year. The final session on Friday afternoon on "Maintenance and Operation Uses of the Oxy-Acetylene Process" was featured by two papers on flame hardening and also proved of unusual interest.

### Round Table Discussions

The round table discussions were again one of the most popular features of the program. The Engineering Session on Wednesday evening and the Operating Session on Thursday evening were attended by more than 1,000 men. The informal atmosphere which prevailed proved the value of this type of meeting for the frank discussion of pertinent phases of the oxy-acetylene process.

Almost 300 people attended the plant inspection trip sponsored by the Tennessee Coal, Iron and Railroad Co. A special train carried the visitors to the rail mill at Ensley, Ala., the Muscoda Ore Mines near Bessemer, Ala., and the open hearth, blast furnaces and new sheet mill under construction at Fairfield, Ala. A barbecued chicken luncheon was served outdoors to the hungry visitors at Fairfield.

### Flame Cutting Effects

H. H. Moss, development engineer, The Linde Air Products Co., New York, presented a paper on "Cutting and Tempering of Structural Steels." All grades of steel do not go through the same change in microstructure during the cutting process according to Mr. Moss. Some steels take on properties in the cut surfaces which differ substantially from the physical properties in the adjacent base metal.

He presented considerable test data based on quenching and air hardening of steels and detailing three methods of flame softening. In two methods described the operation is carried out concurrently with the cutting operation and the usual cutting speeds. In a third method the softening operation is usually carried out at a higher speed. Mr. Moss concluded his technical paper with a long list of applications in which flame softening should be helpful.

R. F. Helmkamp, Air Reduction Sales Co., New York, presented a paper on "Management of Machine Cutting Operations." According to Mr. Helmkamp application of machine cutting to general production problems has been comparatively slow. He included a general description of the process,

Tennessee Coal Iron and Railroad Co. served a barbecued chicken lunch to nearly 300 hungry visitors at the Fairfield plant.

covering its possibilities and limitations, and recommended that plant executives see to it that their department heads become familiar with this process. If these men get to thinking in terms of this new process, they will be able to cut costs in one or more manufacturing operations.

Two other papers, one by A. E. Gibson, president, Wellman Engineering Co., Cleveland, and one by Richard W. Sternke, production manager, Lakeside Bridge & Steel Co., Milwaukee, emphasized the flexibility of design which the flame cutting process makes possible. Both men pointed out how accurately contours may be cut, and included several practical suggestions that should be helpful in handling distortion problems and other difficulties. Both of these men are identified with fabricating plants, making widespread use of the flame cutting process in connection with welding.

### Flame Hardening Applications

A feature of the last day's technical meeting was two papers on the subject of flame hardening. R. L. Rolf of Lakeside Steel Improvement Co., Cleveland, and John T. Howat, of American Spiral Spring & Mfg. Co., Pittsburgh, presented papers on this subject. Operation of the process and its wide scope of application were emphasized. It was pointed out that the process is very flexible and highly successful provided the surface area to be hardened is not too great in relation to thickness of section. Flame hardening makes it possible to selectively harden surfaces that can only be hardened economically in this manner.

R. W. Cummings, general manager, Central of Georgia Railway, Savannah, Ga., reported the experience of his road in connection with track welding. This railroad was one of the first to use welding for track maintenance as a means of building up battered rail ends, butt-welding rails at highway crossings and prolonging life of frogs, crossings, switch points and numerous other items which make up the track structure. Mr. Cummins described in detail the recent use of the oxy-acetylene process in butt-welding rails to secure continuous "velvet track" in two short tunnel sections. He reported that life of rail was more than doubled.

### President Gibson's Address

In his remarks at the opening luncheon, Wednesday, November 10th, President Gibson (now past president) stated:

"In 1892, not so very far from here, calcium carbide was discovered and the progeny of this interesting and valuable substance (acetylene gas) became the object of our attention. Our association was formed in 1898, just a few years after the beginning of the industry. This association, of course, devoted itself immediately to the care and development of this interesting and healthy child. We now can turn back the pages of our diary for the past 45 years and recall the early struggles to find markets for the new products calcium carbide and acetylene. In more recent years, efficient applications of acetylene to automatic welding operations and semi-automatic flame-cutting machines have taken our products over the thresholds of new industrial plants and have projected our interests in the drafting rooms of literally hundreds of industries. And now as we look at our progeny, a healthy man of 40, we find him investigating new fields. Life begins at 40 and carries with it a trace of earlier experiences.

"An astounding proportion of carbide is used in this country for making acetylene which, in turn, is utilized in the production of acetic acid. There is every reason to believe that within the next decade the chemical use of acetylene, which is so rapidly creeping up on the industrial use, will far exceed it. Today scores of basic chemicals can be made as derivatives from acetylene gas. There are many thousands of tons of carbide—the equivalent of millions of cubic feet of acetylene—used in the manufacture of various chemicals. From these chemicals

**ELMER H. SMITH, newly elected president of the International Acetylene Association, is president of the Commercial Gas Co., Minneapolis, Minn. An engineering graduate of the University of Minnesota, Mr. Smith started his career in the welding industry as a salesman for the Davis-Bournonville Co. In 1918 he became connected with the Smith Welding Equipment Co. of Minneapolis. Two years later he became president of the Commercial Gas Co. of the same city and has continued in this capacity.**

**I. A. A. officers for 1938 (left to right): H. P. Dolisio, vice president; H. F. Reinhard, secretary; Elmer H. Smith, president; Henry Booth, treasurer.**

**C. D'W. GIBSON, now a past president, International Acetylene Association, is vice president, Air Reduction Co., Inc., New York. A native of Schenectady, N. Y., Mr. Gibson attended Union College where he studied electrical engineering. He has been active in the oxy-acetylene industry for 18 years and prominent in the affairs of International Acetylene Association for several years, having served as a member of both the Executive Committee and the Program, Publicity and Arrangements Committee, as vice president last year, and president this year. Other societies in which Dr. Gibson is active include the American Iron and Steel Institute and the American Welding Society.**

such diversified materials as rayon, synthetic rubber, plastics, solvents, dyes, perfumes, safety glass and photographic films are being commercially produced. To the non-technical man, this is legerdemain. To the organizations of many chemical companies, it is done with carbide.

"Unfortunately, it is difficult to visualize the magnitude of the acetylene industry with all its ramifications, because the products are used in so many different ways by such a widely diversified group of industries in all parts of the world. When we are told that the automotive industry produced over five million cars this year, we immediately have a picture of the size of that industry. Similarly, the ingot production in tons is a visual measuring stick for the steel industry; oil production in barrels conveys a reasonably clear impression of the magnitude of that field. What can we say that would help us convey, more tangibly, the size of the acetylene industry and its collateral interests? The Bureau of Census in its latest available report on the compressed and liquefied gas industry, tells us that in 1935, 1,133,824,000 cu. ft. of acetylene were produced, and we are duly impressed with the astronomical size of that figure.* Our oxy-acetylene engineers tell us that, if all that acetylene were utilized in making the circumferential welds on 40-ft. lengths of 12-in. pipe, the resulting pipe line would extend over 250,000 miles—more than enough to reach from here to the moon. Still we have failed to give an adequate picture of the size of our industry.

### Railroad Tonnage

"Now, if we go back to the original carbide required to produce our 1935 census figure for acetylene, we find that the annual tonnage of carbide runs to about 8,000 carloads. The tonnage involved in the shipment of full cylinders to customers and the return of empties amounts to another 45,000 cars, making a grand total annual shipping figure of 53,000 cars.

"These statistics apply to the acetylene industry alone, without giving any consideration to the size of its twin brother, the oxygen industry. Without going into the figures, you can visualize the importance of oxygen to American business when you consider that it requires a heavier steel cylinder per hundred cubic feet than acetylene, and that the production of oxygen is about twice that of acetylene. The twins combined form an oxy-acetylene industry that is impressive in its scope.

"To our Oxy-Acetylene Committee must go the credit for a complete series of splendid reports that enable us to take advantage of the knowledge already gained and the experimental work under way in our field. Theirs too is the credit for continually revising and bringing up to date our technical pamphlets on welding and cutting, pamphlets which include the most improved developments and the latest accepted practices. They have also prepared safety instruction booklets, and their report is recognized as a veritable text-book for the industry. Under their guidance, sub-committees, cooperating with the Master Boilermakers Association, the American Society for Metals and other technical associations, have done and are doing splendid work.

"Today the membership in our association has grown to the point where it truly represents the acetylene industry in all its phases. We have gone far past the question as to whether the association is receiving the wholehearted support of the industry. Like most things in life—we get out of the association just what we put in, no more and no less. We do not need members as much as we need ideas and it is marvelous to see the cooperation we are receiving from people outside our industry who are taking an active part in these meetings."

*Some authorities question the completeness of the Census Bureau statistics—Total gas production is claimed to be greatly in excess of the published figures.

**The Lincoln Electric Company's annual sales meeting, held recently at Cleveland, Ohio, was conducted in the new 200,000 sq. ft. factory addition which has a steel frame fabricated and erected entirely by electric welding.**

Shown above are Lincoln sales-engineers, dealers and agents from all parts of the country, grouped around J. F. Lincoln, president of the company, (8th from left, front row). The sales meeting lasted for 3 days and was under direction of C. M. Taylor, vice president and sales manager.

# Morehead Medal to H. Sidney Smith

THE JAMES TURNER MOREHEAD MEDAL for the year 1936 has been awarded to H. SIDNEY SMITH "for his vision, inspirational guidance, and aggressive cooperation in the advancement of the acetylene industry." The award was made at the opening session of the 38th annual convention of the International Acetylene Association at Birmingham, November 10, 1937.

This medal is awarded annually by the I. A. A. to the person, or persons, who in the judgment of its officers and board of directors have done most to advance the industry, or the art of producing or utilizing calcium carbide or its derivatives. The award was established in 1922 by John Motley Morehead in honor of his father, the late James Turner Morehead, who in 1892 sponsored the experiments which led to the discovery of the electric furnace method of producing calcium carbide.

Mr. Smith has also recently been announced as the recipient of the Samuel Wylie Miller Medal awarded by the American Welding Society and thus becomes the first man to receive the two outstanding awards of the welding industry in the same year. He is a well-known figure in the acetylene industry both in America and abroad and has served as president of both the British Acetylene Association and the International Acetylene Association. He has been directly responsible for many important developments in acetylene utilization.

Mr. Smith was born in Newark, England, and was educated at Nottingham University, where he studied electrical engineering. In 1901 he turned his efforts toward experimenting with the use of dissolved acetylene and oxy-acetylene welding. As a result of his intensive work on dissolved acetylene, its use was sanctioned by the British Home Office. In 1911 he came to America and joined The Prest-O-Lite Co., Inc., in Indianapolis, becoming works manager in charge of all gas plants. In 1918 he became consulting engineer for Union Carbide Co.

In his long and active career with Union Carbide Company and its associated companies,

H. SIDNEY SMITH

he has made many important contributions to the oxy-acetylene industry, and has been the author of numerous technical articles on the uses of oxygen, acetylene, calcium carbide and oxy-acetylene apparatus. One of the first instruction manuals on oxy-acetylene welding and cutting was written by Mr. Smith, and he has been active in the technical training of many men who are now taking leading parts in the industry.

Elected president of the International Acetylene Association in 1920 and president of the Compressed Gas Manufacturers Association in 1928, Mr. Smith has also been for many years a director and a member of the Executive Committee of the American Welding Society. He is a member of the American Society of Mechanical Engineers, the American Society for Testing Materials, the National Fire Protection Association, the National Safety Council, the American Society of Safety Engineers, and a number of other engineering groups. In practically all of these associations, Mr. Smith has served in important executive capacities.

Review of current progress in the

# Oxy-Acetylene Industry

★ Steel industry activity looks promising—Railroad uses increasing—Multi-flame tips for pipe welding—Flame cutting and flame hardening actively developed

**By DR. G. V. SLOTTMAN**

**Air Reduction Sales Co., New York City**

THE ECONOMIC VIGOR of an industry is measured not only by the facility with which it suits its gait to the varying trends of the business cycle, but also by its ability to develop new processes as outlets for its products to replace that portion of its substance lost by the constant attrition of competitive industries. The year 1937 tested the vigor of the oxy-acetylene industry not only to the limit of its productive capacity; it tested its ability to supply technical developments in large measure to answer the insistent pressure of the industries it serves to make things faster, cheaper and better.

### Scrapping Programs

For industry in general, 1937 was a year of renovation, of expanding productive equipment, of scrapping obsolescent parts. The world armament race brought scrap from the steerage of freighter bottoms to the first class of luxury liners and this enhanced value of scrap added impetus to the desire of industry to make room for expansion by sloughing off outmoded equipment. Extensive and highly organized scrapping programs thus became a feature of the year's activity. In the heavy industries, where obsolescent equipment was plentiful and particularly in the railroads with thousands of worn-out cars to be replaced, the oxy-acetylene cutting torch gave a ready answer to the problem of rapidly converting millions of tons of scrap to salable size. Thousands of new cutting torches were lit throughout the country and placed in the hands of men with no previous training in our industry. The problem of training these operators in particular, and of taking up the slack caused by the general lack of oxy-acetylene operator apprenticeship during the depression years, was thrust squarely upon our industry in intensified form by this scrapping activity. Operator training occupied a good portion of the year's service of our industry.

### Oxygen Distributing Systems

Another feature of the year 1937 was the increased acceptance of the oxy-acetylene process as one which warranted a permanent investment in the form of pipe lines to distribute oxygen and in some cases acetylene from central locations to all consuming points. An ever increasing number of industrial plants have come to the realization that, with oxygen piped and conveniently available throughout a plant, many problems which yielded laboriously to the hacksaw or sledge, disappear entirely in the heat of the oxy-acetylene flame.

Oxygen, instead of being the proverbial plumber's tool to be gone after, stands ready to serve at the turn of a valve. The general availability of pipe line oxygen throughout industrial plants, and particularly in those departments where use is heavy, is coming to be the accepted form of oxygen distribution. The service of the oxy-acetylene industry in fostering, planning and installing such piping systems has resulted in a wider use of its products, and has benefited industry in general by increasing the efficient and economic use of its processes.

### Steel Mill Activity

The use of oxygen to condition steel stock for the finishing mills, and to replace the chipping hammer, is becoming widely accepted. Formerly regarded as, at best, a salvaging process, to reclaim stock too badly cracked to warrant chipping, deseaming is taking its place as a production tool of the steel industry. The advent of the high production continuous strip mills to be fed with large tonnages of conditioned slabs, and the increasing quality demands of steel consumers requiring finer conditioning of the stock, have brought the scarfing torch into the chipping yard. Larger sections, ingots, slabs and blooms are being generally skinned or spot scarfed with the oxy-acetylene torch. The extension of the process to billet sections as small as 2-in. squares is in progress and promises to be as universally acceptable as the conditioning of larger stock. To quote the words of an executive of one of the country's largest steel producers, "The use of the oxy-acetylene process for steel conditioning is without doubt the most significant development in the art of steel making within recent years."

Presented at the 38th annual convention, International Acetylene Association, Birmingham, Ala., November 10th, 11th and 12th, 1937.

### Machine Deseaming

Machine operation of scarfing torches marks a further development of the steel conditioning process. By mounting a number of scarfing torches on a traversing carriage, whole surfaces of blooms 14 in. in width can be removed at linear speeds greater than 2 ft. per sec. The problems of surface condition in high quality steels, which have been solved in the past by mechanical skinning tools, are now being attacked from the basis of using stationary scarfing machines permanently located at the blooming or slabbing mills to desurface completely the hot slab or bloom as it passes to the finishing mills.

### Railroad Activity

Railroad activity in car scrapping has already been commented on. As with the renovation of the rolling stock, improvement of the right-of-way was similarly studied. Wider application was made of the oxy-acetylene process of rail joint hardening to resist batter, and the building up by welding of battered rail ends. A number of machines were developed with the purpose of making the rail-end hardening process semi-automatic. Rail joint betterment programs running into hundreds of miles of track were common on the larger roads.

Several large rail cropping programs made use of oxy-acetylene cutting machines in place of friction saws for producing a smoothly cut rail section, back of the battered end, suitable for re-service in the line and at a considerable saving in time and money over the older process. Rail joint welding to eliminate joint maintenance entirely, and to improve electrical conductivity for signal and power circuits continued to find growing application. Oxy-acetylene bronze or steel welding of mine car and industrial crane rails has become common practice. Several long tunnel sections of railroad rail were oxy-acetylene steel welded. Experimental work on railroad track in the open has also been continued, with promising results.

### Pipe Welding

The introduction of multi-layer or multi-pass oxy-acetylene welding of heavy wall pipe for high-pressure, high-temperature steam and oil lines marked a new development in the pipe welding field. The grain refining and stress relieving effects of multiple passes laid down with the oxy-acetylene torch have allowed of obtaining physical properties, particularly in ductility and impact resistance, suitable to the most exacting service.

**Wide-spread acceptance and specification of welded piping during past year created a demand for trained pipe welding operators.**

Continued use is being made of multi-flame tips and semi-automatic multi-flame welding holders, particularly in the production double-lengthening of pipe in the mill. The problem of welding casing in the oil fields of the southwest and of producing welds in the higher carbon ranges which will stand drastic quenching without serious effects on physical properties was investigated with promising results.

Mechanical welding of pipe and tubing using multi-flame oxy-acetylene welding tips was a very active field and the past year saw a large number of new applications of this process.

The wide-spread acceptance and specification of welded piping in governmental resettlement and private housing projects during the past year created a demand for trained pipe welding operators which was successfully met by the cooperation of many educational bodies. Municipalities cooperated in offering the facilities of their trade schools. In some localities, trade unions offered courses to their members. Much of this educational work however fell upon the members of the oxy-acetylene industry as suppliers of equipment and welding gases.

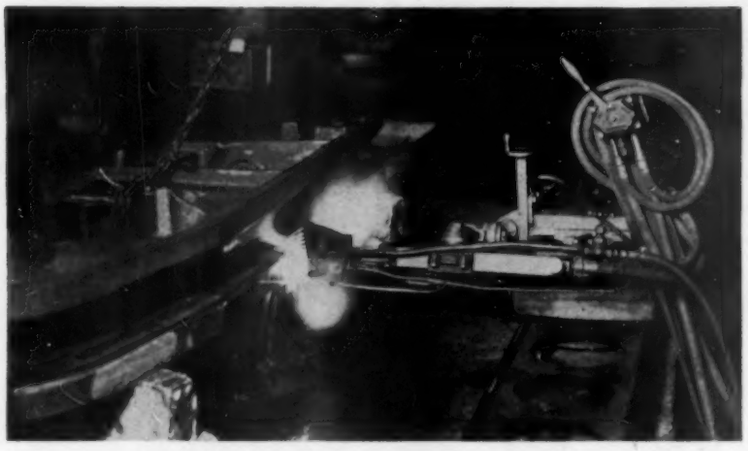
### Non-Ferrous Activity

In the non-ferrous field, the wide acceptance by codifying bodies of hard solders of the silver solder type, applicable with the oxy-acetylene flame, has opened up virgin territory in replacing older methods of fabrication in general plumbing. Here again the problem of educating old crafts to new processes has fallen upon our industry. One of the most spectacular uses of silver solders, and one which will be discussed during the present convention, is in the assembling of copper bus-bars for collecting and distributing electric current in large central station and other power projects. Jointing of the bus-bar members was formerly done with rivets or special clamps. Vibration and the continual heating and cooling of the joints in service gradually increased the resistance of the joint, impairing its electrical efficiency and becoming a source of constant maintenance expense. Silver soldering these members provides joints of exceptionally low electrical resistance, high physical strength, freedom from maintenance and allows of streamlining the bus-bar assembly, improving its utility and appearance.

Bronze-welding continues to be an accepted method of rebuilding worn parts and for heavy maintenance and repair work. As bronze-welding requires only tinning of the base metal to form a permanent bond, it is possible to repair many broken parts in place using only light local preheating. Strong ductile welds are made, often superior in strength to the base metal. This makes possible the salvage of many expensive parts, and what is frequently more important, prevents long shut-downs of productive equipment. In this latter field, bronze-welding repeatedly performs in spectacular fashion to the benefit of the heavy industries.

### Fabrication and Machine Cutting

Increased use of fabricated parts and intensified activity in machine cutting development have marked the year's activity in the general manufacturing industries. A rapid transition in the status of oxy-acetylene cutting from the roughing out tool to the accurately precise finishing tool is taking place. A wide variety of oxy-acetylene cutting machines are available to the fabricating industries from the light portable straight line and circle cutting machines to production



**Flame hardening is gradually extending its field of application to include large gear teeth, sheave wheels, cross-head guides, cam shafts, ball races, sprocket wheels, shafts, guide plates (above) and other wearing parts.**

machines capable of cutting plates of unlimited length and in the greatest widths rolled, without movement of the work. Multiple torch operation on these machines allows of mass production of washers, flanges, car frames and similar parts.

Much attention has been given to the planning of fabricating problems, to the selection of suitable equipment from the variety of machines available, to the handling of material at the machines and to production scheduling to insure their efficient use. Portability and flexibility have always been considered among the prime advantages of cutting machines. This concept of a cutting machine, as being a portable tool to be brought to the work, has been changing in certain operations, particularly in riser cutting, to that of a tool permanently located on a production line working on the passing material. The mechanical features of cutting machines are being constantly studied and improved to increase their precision and to reduce vibration, lost motion and other sources of cut irregularity.

### Development of the Cutting Process

The cutting process itself and the effects of oxy-acetylene cutting on the physical properties of certain steels have been studied and the scope of the cutting field continuously expanded. Silicon structural steels have been more difficult to cut than mild steels, without loss in impact resistance and in ductility of the cut edge, and such steels have sometimes required post-cutting machining of the cut edge to depths of ¼ to ½ in. The use of multi-flame heating tips either before or after the cutting jet to reduce the self-quenching action of the cold base material and to retard the speed of the air quench has made it possible to cut these steels without impairment of the physical properties of the cut surface.

Similarly, with high-carbon steels which show a tendency to check at the cut surface, the use of auxiliary preheating flames to preheat the line of cut has made it possible to cut such steels without preheating the entire piece. Methods have also been developed for machine cutting the stainless and Monel clad steels, which have proved of great value to the industries using these materials.

### Flame Hardening

An interesting development of the past year has been the revival and wide-spread application of the old process of torch hardening. This process, variously known as flame, surface, selective, or torch hardening utilizes the oxy-acetylene flame as a heating medium in an operation metallurgically analogous to the widely used furnace hardening methods. Dating from the beginnings of the oxy-acetylene industry and used in a limited manner in certain applications, the general utility of this process has been strangely restricted. Makers of heavy machine parts, too large or complicated to stand furnace treatment, have accepted the wearing-out of the contact surfaces of such parts as a natural concomitant to their use. That the contact surfaces of such parts, when made of hardenable material, could be hardened to depths of ¼ to ½ in. without changing the physical properties of the core, or without distorting the structure was not generally believed.

Starting with the contact surfaces of large gear teeth, this process has been gradually extended to cover a wide field of application including sheave wheels, cross-head guides, cam shafts, ball races, sprocket wheels, shafts and other wearing parts common to machine design. The past year has seen an increasingly general recognition of the scope and utility of this process by machine manufacturers. An active development of suitable oxy-acetylene equipment, particularly water-cooled multi-flame tips and torches, and machines for guiding these tips across the surfaces to be hardened, and a thorough study of the hardening technique are in progress, which will make the flame hardening process steadily more serviceable to industry.

### Welding Codes

Continued acceptance of welding and cutting by the various codifying bodies has been a feature of the past year. Of most general import perhaps, is the allowance of structural welding in the

**The cutting blowpipe is an indispensable tool in welded pipe fabrication of heavy wall pipe for high pressure, high temperature steam and oil lines.**

recently revised building code of the City of New York, particularly since this code serves as a model for many other municipalities throughout the country. A broad increase in the use of the oxy-acetylene process for cutting and preparing welding surfaces in the field is to be expected as a result of the more general application of welding in building construction. Similarly, the tentative Refrigeration Code of the City of New York has recognized the superiority of welded and brazed joints in refrigeration service.

Attention has been called to the large increase in oxy-acetylene operators, both welding and cutting, during

the past year and the problem involved in maintaining a supply of trained craftsmen equal to the demand.

The members of our industry have individually campaigned for the safe as well as efficient handling of their gases and equipment through the distribution of literature and through the personal instruction of oxy-acetylene operators by their service organizations. Your committee has had under consideration for the past two years a booklet, "Safe Practices in the Installation and Operation of Oxy-acetylene Welding and Cutting Equipment" which is intended to incorporate the best features of existing literature on the subject, and to serve as a reference work on the subject. Many comments, suggestions and criticisms were received from our members, all of which were given careful consideration in the final wording and arrangement of the text.

In addition to the "Safe Practices" booklet, a number of pamphlets previously issued were revised prior to reprinting further editions. For example, the pamphlet on "Oxy-Acetylene Cutting" was expanded to include chapters on the "Effect of Flame Cutting on the Metal Being Cut," and a resume of the action of the Boiler Code Committee of the A.S.M.E. The chapter on the "Chemistry of Cutting" was improved and expanded and a number of illustrations added to the discussion of "The Scope of Flame Cutting." The pamphlet "Oxy-Acetylene Welding and its Applications" was revised to include data on upward welding, alloy cast iron welding, multi-layer welding, multi-flame welding and welding of heavy pressure vessels.

# Armour Institute of Technology Series of Welding Lectures

Armour Institute of Technology, Chicago, has arranged a series of 18 evening lectures on welding practice and design to be given the first three weeks of December, 1937 and the corresponding period of January, 1938. These lectures are for the purpose of aiding engineers and welding technicians to obtain a general and yet scientific knowledge of the field of commercial welding. To this end the subject of design will be emphasized in many of the subjects listed.

The lectures will be of an informal nature and questions will be answered freely. All meetings will start at 7:30 p. m. in the Physics Lecture Room, second floor of the main building of the Armour Institute of Technology, 3300 Federal St., Chicago. Each lecture will last from one to two hours.

Additional information can be obtained by addressing L. E. Grinter, director of the conference. No college or graduate credit will be granted for attendance at the conference.

### Program of A. I. T. Conference

TUESDAY, NOVEMBER 30, 1937
Metallurgy and Heat Treatment of Welds
DR. W. A. PEARL
Director of Engineering Shops
Armour Institute of Technology

THURSDAY, DECEMBER 2, 1937
Metallurgy and Heat Treatment of Welds
DR. W. A. PEARL
Director of Engineering Shops
Armour Institute of Technology

FRIDAY, DECEMBER 3, 1937
Heavy Pressure Vessels
L. J. LARSON
Director of Welding Research
A. O. Smith Corporation

WEDNESDAY, DECEMBER 8, 1937
Tank Welding Research and Design
H. C. BOARDMAN
Research Engineer
Chicago Bridge & Iron Co.

THURSDAY, DECEMBER 9, 1937
Pressure Tanks and Code Requirements
H. C. BOARDMAN
Research Engineer
Chicago Bridge & Iron Co.

FRIDAY, DECEMBER 10, 1937
Highlights of Welding Design
C. S. MOODY
Metallurgical Engineer
Northwest Engineering Co.

TUESDAY, DECEMBER 14, 1937
Jigs and Fixtures
JAMES SHIFFLI
Product Engineer
American Steel Foundries

THURSDAY, DECEMBER 16, 1937
Design of Tall Steel Stacks for Welding
J. C. SANDERSON
Structural Engineer
Sargent and Lundy

FRIDAY, DECEMBER 17, 1937
Structural Welding Design
V. O. MCCLURG
Chief Structural Engineer
Holabird and Root, Architects

TUESDAY, JANUARY 4, 1938
Welding of Heavy Machinery
Westinghouse Manufacturing Co.

THURSDAY, JANUARY 6, 1938
Welding of Heavy Machinery
Westinghouse Manufacturing Co.

FRIDAY, JANUARY 7, 1938
Research on Pipe Welding
E. R. SEABLOOM
Research Welding Engineer
Crane Company

TUESDAY, JANUARY 11, 1938
Code Studies for Pipe Welding
E. R. SEABLOOM
Research Welding Engineer
Crane Company

THURSDAY, JANUARY 13, 1938
Railway Track Welding Research
G. M. MAGEE,
Ass't Director
Research Division
Ass'n of American Railroads

FRIDAY, JANUARY 14, 1938
Construction and Maintenance of Modern Railway Equipment
G. M. MAGEE,
Ass't Director
Research Division
Ass'n of American Railroads

TUESDAY, JANUARY 18, 1938
Maintenance of Railway Bridges
G. M. MAGEE,
Ass't Director
Research Division
Ass'n of American Railroads

THURSDAY, JANUARY 20, 1938
Building Design for Welding
A. M. CANDY
Consulting Engineer
The Hollup Corporation

FRIDAY, JANUARY 21, 1938
Welding Practice and Design
A. M. CANDY
Consulting Engineer
The Hollup Corporation

UNIVERSITY OF KANSAS, Lawrence, Kan., will hold its next annual welding conference on Thursday and Friday, March 31-April 1, 1938. A. H. SLUSS, professor of mechanical engineering, will supervise all arrangements for the conference.

THE SCHOOL OF WELDING, Los Angeles, announces that 27 students are enrolled in the Fall classes. This is full capacity for the institution, and several applications are on the waiting list. A new building is contemplated to accommodate the need for more room. OREN V. HARRIS, formerly of Kansas City, Mo., recently joined the school as general instructor.

More than 1,000 linear feet of welding was required to fabricate this huge absorber vessel designed for use in treating oil—Photo, courtesy of Westinghouse Electric & Mfg. Co.

An attempt to define the

# Job of Welding Engineer

★ What type of technical and shop training is needed?—Outline of educational program is suggested by the author

By R. KRAUS

Welding Engineer, Stacey Bros. Gas Construction Co., Cincinnati, Ohio

For the past 15 years engineers of progressive companies have directed their efforts to the development of welded fabrication, acquiring knowledge and experience which is proving helpful and profitable. Other concerns, to remain competitive, or share in the new business possibilities, realize the necessity of systematic work in the new field and are delegating the duty to an engineer, generally designated as a welding engineer. At this point the question arises: "How can we develop a welding engineer?"

The first thought is to have the engineering schools supply the demand, and suggestions are in order as to the subjects a welding engineer should study. No general agreement seems possible as yet for the simple reason that the function of a welding engineer is still to be more clearly defined. For example, without going into too much detail, one plant may have the problem of handwelding heavy alloy plates, while another plant may be mostly concerned with the automatic welding of thin plates.

Some schools are already helping by adding related subjects to their engineering courses, but the extent of these new subjects can hardly go much beyond the scope of training in other subjects, related to the main engineering course. Consider for instance, the practice of teaching the principles of electricity, chemistry, etc., in a mechanical engineering course. Postgraduate studies are available covering certain allied lines. But the choice of additional subjects to be taught to the future welding engineer will not solve the problem, in my opinion, because a practical welding engineer can only develop through application in a specialized field.

In a general way, any good course in engineering will be a suitable foundation for developing into a welding engineer. But from there on we must realize that the problem is to train an engineer suitable for a function that is not yet standardized. For that reason we must consider the man himself in making the choice. It requires the rare combination of liking shop and field work and being interested in study beyond the classroom, in order to acquire additional information as needed, whether it be in electrical work, mechanical design, stress calculation, metallurgy, or methods of fabrication. The engineer himself must understand in which of the branches he needs to enlarge his knowledge. It is also important that a welding engineer have a suitable personality and be capable of cooperating with the engineering department, the shop organization, the sales and purchasing departments.

I am inclined to believe that an engineer should have 10 years or more of design experience, before specialization in welding. Many shop engineers acquired good design experience before entering upon specialization in welding, through the contacts made in the

normal course of their work. In short, it is interest and ability that counts most.

"How can I become a welding engineer?" has been put up to me by engineers and shop men, looking for an opportunity to improve themselves in this new field. My answer every time is: "Prepare for the opportunity and most likely it will show up right in the organization you are with."

### Suggested Background

Having discussed the general problem of developing a welding engineer, I shall try to describe his routine work. I am hopeful that it will help those who have recently entered this work or who desire to enter it, by giving them a clearer idea of what the work is and along what lines to study in order to equip themselves for the solution of welding problems.

The first question always asked is: "Should a welding engineer know how to weld, and if so how much time should he spend in actual welding?" A prospective welding engineer must certainly learn how to weld, but the acquisition of purely manual skill is not what I mean by learning how to weld. It would be of little value as such, unless used as a means of developing the ability of keen observation. There are too many demands on the time of the engineer to allow him to do actual welding. However, the ability of keen observation should become second nature, because the conditions in welding are changing by virtue of different designs, new metals, improved electrodes, etc. Also, welders possess varying degrees of skill.

The safety of a structure, as well as its economical production, depends on the welding engineer. It is even more necessary for him than for the welder to learn welding with his head more thoroughly than with his hands. Welding has been taught too often as a repetition of certain mechanical motions. This method emphasizes the "fireworks", without scrutinizing the function of the arc or torch and the control of it for the real purpose intended, which is penetration and fusion of metal.

What is the difference between a welder, a welding supervisor, and a welding engineer? I shall try to answer this question.

The welder must acquire sufficient mechanical skill to produce an economical quantity of work of definite quality. The length of time needed to acquire this degree of mechanical skill will vary. A shop welder, doing repetitive work, positioned for him, will generally be an acceptable operator in about six to eight weeks. A maintenance man will require several years to mature because he not only does welding both with arc and gas, but becomes proficient in fitting, and in handling a variety of tools, such as cutting equipment, air hammers, air drills and scaffolding to enable access to the work at different elevations. A field welder also requires several years to develop, because he has to do all his work in position, with or without scaffolding, and is exposed to all kinds of weather conditions. He commands a higher rate than the other two classes of welders, for the reason that he has adapted himself to field work and can produce a sufficient amount of welding under various conditions.

A welding supervisor generally develops from a welder, due to a combination of better training, more skill, and organizing ability. He becomes a foreman, assigning work to men and pushing production.

### The Connecting Link

It is different with the welding engineer. While he is active in production, his work is mostly advisory. He is in steady contact with the welders, and exercises general supervision in the shop through the various foremen in the sections where the component parts of a machine are fabricated, welded and tested. In a well organized shop, there is no overlap between the welding supervisor and the welding engineer. They cooperate to mutual advantage. The welding engineer is the link between the designers and the shop for influencing the design, preparation of component parts prior to welding, assisting in the choice of welders and equipment, helping the welders correct faulty methods and giving them better methods or new applications. His steady contact with the work enables the welding engineer to carry out his varied duties.

The welding engineer should learn welding in order to develop the keenest observation of correct action of the arc or blowpipe. That enables him to recognize good or faulty technique and also to recognize other conditions interfering with correct welding practice.

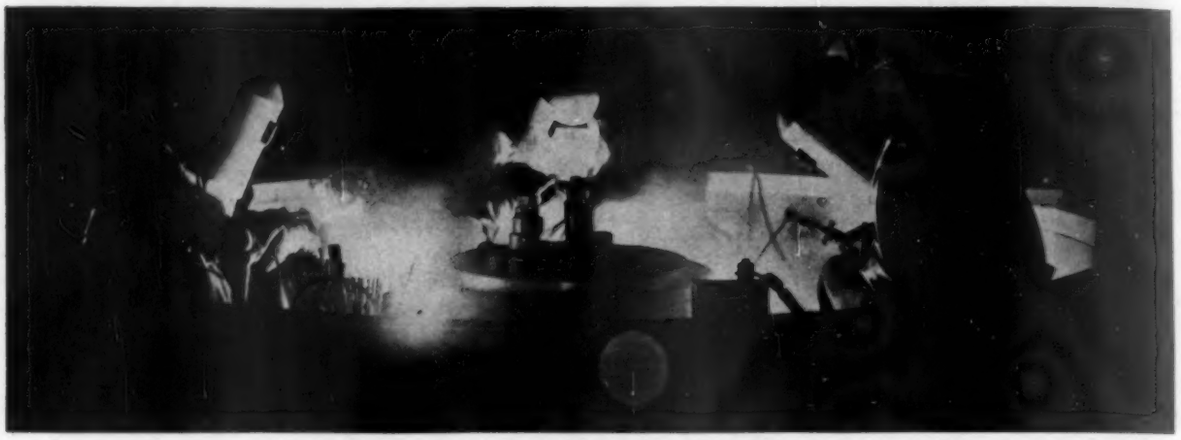
Let us consider the problem of correct welding technique. Methods of teaching welding are still in the development stage. Some men have picked up the rudiments in a welding school in four to eight weeks. Others have picked up welding while helping experienced men. Either method of initial training demands that the operator learn more about it, while engaged in the actual work. The welding engineer will find a fruitful field among these men, even after they have been working at their trade for years and are seemingly proficient. They will welcome assistance in overcoming lack of fusion in the apex of fillet welds, whether flat or vertical. Undercutting in flat or vertical fillets, or at the edge of pipe butt-welds is another trying defect that can be cured by the welding engineer much better than if left to imitation of a motion used by a particularly gifted welder, who may not be able to explain the reason for the results he accomplishes. Welders who learn to imitate certain motions without grasping the reasons for them, are the ones who may pass a code test one year and fail at it the next year.

The welding engineer can help with the study of the problem of expansion and contraction. In my opinion little material is available that will assist the welder in the handling of large welded structures. Making intelligent reports of results obtained in this particular work is extremely desirable for the good of the welding industry.

Metallurgy will be called upon to do its share in assisting the welding engineer in his problems. Proper technique applied to some steel alloys will eliminate the necessity of stress relieving, or will help to accomplish even better results with stress relieving. Intermediate failures can also be avoided at times, if the engineer knows that certain copper alloys are "hot short." The first weld will have a sound joint, but if rewelded a crack is likely to appear in the weld.

### Automatic Welding

In some plants the welding engineer has to concern himself with automatic welding. Here again is a great opportunity to apply engineering training and the specialized observation of arc behavior. Automatic welding equipment is generally built to suit the type of product manufactured. This can be done better by the company needing the equipment, than by an outside contractor, because the former is familiar with production requirements. The welding head, of course, must be bought from a company which specializes in building them.



**"Three Men In A Tub"—These welders in the Lynn, Mass., plant of the General Electric Co. resemble fantastic creatures from another world as they fabricate a huge low-speed marine reduction gear.**

For illustration let us consider the welding of a tank bottom to the shell of a small tank. If a tank bottom were absolutely round and the shell placed and kept concentric with the turntable, the arc, once located, could be left in a stationary position and the weld could be made without further adjustment. Each point of the periphery would in turn meet the arc and the welded seam would be completed. However, the contour of the bottom does not remain a perfect circle after it leaves the forming press, neither is the axis of the tank absolutely concentric with the turntable. Due to these conditions, it is necessary for the operator to follow the seam with the arc. The irregularity is gradual which gives the operator a reasonable time to guide the arc over to the right spot, provided the equipment is so designed as to permit it.

### Tool Designer Needs Help

This is, unfortunately, not always the case, because the tool designer is not familiar with this phase of the welding problem and the correcting adjustment cannot be executed in the time available. In this case the welding engineer must be the link between the tool designer and the shop.

Beside guiding the welding technique the welding engineer must give his attention to conditions which interfere with the satisfactory action of the arc. These conditions should be recognized by the welding engineer, in order that loss of time can be avoided. An erratic arc can be frequently traced to grease on the exciter brushes, worn main brushes, poor ground clamps or poor ground connections.

For example, consider the welding of paint beds with paint accumulated on the top rails from many years of spraying. The current, instead of being conducted uniformly from the rails to the piece being welded, is interrupted now and then through the thick coat of paint. Such a condition causes delays and poor work. The size of welding machines to use can be much better decided by the welding engineer than by the salesman selling the equipment. It is not rare to find a shop filled with 300-amp. machines when 200-amp. machines would serve the class of welding work much better.

### Welding in Comfort

Operators will fare better and their output will increase if the right kind of welding shields and electrode holders are provided. A welding shield that weighs even ½ lb. more than necessary feels, on a hot day, like holding a ton. Some welders buy their own shield because they are ambitious enough to want to produce good work without any handicap. Poor electrode holders will contribute a good deal to loss of time and poor quality of work. Just picture a man welding vertically with a holder that will not clamp the electrode firmly enough to keep it pointing upwards, but lets it slip to a position pointing downward.

The welding engineer must cooperate with the time-study department. Time studies for establishment of bonus payments are only of value after the procedure has been fully approved by the welding engineer.

The welding engineer can be of great help in the testing of welders. After a welding procedure and the filler metal to be used, has been proven, it is necessary to check the skill of the welders. In doing this the welding engineer can duplicate working conditions, which influence the final results of the welding. Using this method of test, welders are hired who can do a job reliably under working conditions, instead of hiring welders who have learned to make test pieces under ideal conditions.

Oxy-acetylene cutting is an essential process in welded fabrication. Without going into too much refinement it should be noted that a ¼ in. plate can be cut better with an acetylene pressure of 3 lbs. and an oxygen pressure of 15 lbs., instead of acetylene 12 lbs. and oxygen 35 lbs. This is just an example of how a welding engineer can be helpful in this part of the work. An inexperienced operator does not know that too much oxygen pressure causes undercutting and is wasteful. Advising the fabricating department when high-carbon alloys have to be preheated prior to cutting and normalized after is another welcome aid from the welding engineer.

### Help the Designer

So far we have considered the work of the welding engineer as it is connected with the shop. This was done because the welding engineer is often pictured as functioning in the shop only. Actually, an engineer has to earn his promotion by his interest in welding design. By more intimate contact he will qualify himself to assist the engineering department to adapt their design to more economical fabrication. He can help them design joints which can be produced with greater ease and at lower cost. He can point out where welding can be replaced to advantage by castings or riveted structures.

Those who are entering the welding field seriously should follow the leading periodicals, study some portions carefully and supplement their information by referring to back copies

when necessary. There are also some good books available that will be helpful. A man must learn welding in an orderly fashion, not mechanically. He must learn to understand the "why" of the motions he goes through if he is to be of later assistance to other men coming into the industry.

# Welding Plays Important Role In Cement Plants

By D. M. TYLER*

In the writer's experience of over thirty years around a cement plant one of the outstanding steps of progress has been the increased use of welding. When we think back to the conditions of operation during the early days we remember the tremendous wastage of material and time, as well as loss of life and limb, in the old line shaft driven plants.

Huge junk piles accumulated because there were no means of building up parts when they were slightly worn. Large castings were thrown away when a crack occurred. The element of time, so expensive in the loss of production, was often forfeited because it took weeks and sometimes months to secure a new part.

D. M. TYLER

### Three Applications

It would seem to me that there are three departments in which the art of welding (and cutting) has proven itself a salvation in cement plant operation:

(a) Building up of worn parts.
(b) Emergency repair of broken parts.
(c) Construction work.

We have the built up shafts, especially where the wear has come in one particular place on the shaft. Building up teeth on steel gears is another application. In fact, we have formed and completely rebuilt individual teeth and thereby saved an entire gear.

Spreading a protecting coating on parts, subject to excessive wear, has added tremendously to the life of these parts. I have in mind particularly such parts as: Drag chain, links, die rings, fan blades, crusher segments, lathe centers, pump screws, elevator throats and dipper teeth.

Probably in no other department has welding saved so much time as in emergency repairs. The very nature of cement mill operation is rough. Heavy and abrasive materials are handled continuously causing excessive strains, resulting in unusual breakages. It is the emergency repair of such breakdowns that, to my mind, mean so much to cement mill operation. Machines, the continuous operation of which mean so much in dollars and cents to the cement plant, have been started up again within a few hours after a break-down with welding; whereas before much time was lost taking out the broken part, purchasing, waiting for delivery and installing the replacement.

All types of machinery have been thus repaired. Air compressors, shovels, cranes, locomotives, grinding machinery, motors, boilers; all most essential to continuous operation.

### Structural Welding

Welding has, to a tremendous extent, speeded up construction (as well as the cutting torch in demolition). Whereas before much time was consumed drilling and riveting structural steel, arc welding has to a large extent eliminated this delay. In a large structural steel building, just completed by our company, the building was bolted together, the joints arc welded and the bolts spotted, at a large saving. Small buildings are cut, fabricated and arc welded on the job at a minimum of time and cost of material. Junk material is used up in this manner that otherwise would be thrown away. We have used old pipe quite extensively in such construction with arc welding.

Arc welded fabrication, using steel sheets and plates, has, to a great extent, taken the place of castings. Such items as motor bases, pulleys, bearings, gears, conveyor-boxes, ball and roller bearing housings and transmission housings; all have been successfully built with arc welding. Shells of tubular machines, such as rotary dryers, kilns, tube mills and the like, have been successfully welded.

In all types of piping, welding has done away with a large number of fittings and screwed joints and thus eliminated, to a large extent, the tremendous joint leakage loss.

Chester L. Wright, chief welder at the Dewey plant of the Dewey Portland Cement Co., Dewey, Okla., advises student welders, to study blue print and layout work, as it will greatly increase their efficiency and usefulness.

In the early history of welding, the welder was just a sort of fixer, who would build up worn spots and fill holes, etc. But in this day and age welding plays an important part in the manufacture of a great many things where the welder is required to follow a blue print. Many beginners think that as soon as they can handle the arc and form beads in all positions, they are ready to go out and get a job in most any welding plant. Such welders have gotten by pretty well in the past, but the present demands welders who can read blue prints.

*Mr. Tyler is vice-president of the Dewey Portland Cement Co., Dewey, Okla.

## How to Handle Grievances

Intelligent management in industry and business is alive to the necessity of dealing with employee grievances in an intelligent and effective manner. As a guiding work manual for all men (and women) in supervisory authority, "How to Handle Grievances" is the title of a compact and interestingly written little book just published by Elliott Service Co., 219 East 44th St., New York. For the benefit of men in the welding industry who have some degree of management responsibility,

we quote below from the introduction by Glenn Gardiner, the author:

"Exceedingly few employers are indifferent to the desires, the feelings, and the rights of their employees. The overwhelming majority are sincerely interested in honest, fair play.

"All too many of the major controversies arising within industrial organizations are the result of ill-advised handling or neglect of the little grievances, which individually may seem trivial, but which collectively may become explosive.

"Most instances of strife between employers and employees have their beginning at a point within the organization—a spark that sets off the powder-keg.

"This book is designed to present in the most direct and practical way possible the fundamental principles which have been found to be effective in the handling of grievances. Most top executives today are realizing that they can ill afford to have any person occupying a position of supervisory responsibility, who is not capable of dealing effectively and understandingly with the worker who has a grievance.

"The material in this book is so presented that it may be used by individuals as a guiding manual, or as a text for the use of companies desiring better to train their supervisory forces in the handling of grievances. Provision has been made throughout for inserting personal notes or company comments to supplement the text.

"The principles set forth apply with equal force to large or small organizations, a company operating under a union agreement or an open shop. It is designed as a help to those who are earnestly striving to make industry a place in which fair play, mutual understanding, and harmonious relations prevail."

**Here is the way lightweight stainless steel cars are put together—A workman in the Budd plant is shown placing a "Shotweld" in one of the side wall members of a car**

# Newest of Stainless Steel Streamlined Trains

The first light-weight, stainless steel, streamlined train to serve Philadelphia and the first of its kind to be seen in the Middle Atlantic states started running December 13th on a fast schedule over the Reading Railway between Philadelphia and New York. The five-car, air-conditioned streamliner makes two round trips daily.

This newest product of the Philadelphia plant of the Edward G. Budd Mfg. Co., is decorated in accordance with designs developed by Paul P. Cret, who is noted for work of this character. While the train's schedule will be fast and convenient, Reading officials have largely concerned themselves with its safety, luxury and comfort.

**E. W. SCHEER, left, president of the Reading Railway System, is pictured here with EDWARD G. BUDD, president of the manufacturing company which bears his name. They are shown inspecting one of the lightweight, stainless steel cars which will go to make up the streamlined train.**

**Looking down the aisle of one of the coaches on the new Reading stainless steel streamliner—The revolving and reclining chairs are seen in the foreground, with the smoking-lounge compartment in the rear of the coach**

The locomotive is a Pacific type, encased in a modern streamlined shell. The shell is constructed of stainless and painted steel with Reading blue as the predominating color. The stainless steel portions consist of dull and bright finished materials so placed as to achieve maximum decorative effect and to provide a pleasing contrast with the brightly painted upper portion. The sheathing in the vicinity of the smokestack is so constructed that it causes the smoke to be carried upward, making for the utmost in cleanliness.

The center car contains a 24-passenger dining room, a cocktail lounge and a stainless steel kitchen. The cocktail lounge will accommodate 27 passengers and is fitted with sofas, comfortable and colorful chairs and tables. This section is separated from the dining room by low partitions surmounted by glass panels which extend as high as the upper window rail.

### Kitchen Equipment

All equipment in the kitchen is made of stainless steel with the exception of the coal burning range. The side walls are covered with sheet stainless steel. The all-metal interior is bright and gleaming, creating an atmosphere of cleanliness which is easily maintained. The kitchen is fitted with a separate ventilation system. The doorway between the kitchen and the dining room is constructed so that a curtain of air shuts out the food odors from the passenger compartment.

Each of the car bodies is fabricated of 18-8 stainless steel by the exclusive "Shotweld" process into an integral unit. Fundamentally, the roof and understructure serve as compression and tension chords of a beam. Doors are of all metal construction with shatter-proof glass in the upper portion. The passenger steps are so arranged that they are raised into the car body when the vestibule trap doors are closed, presenting a smooth exterior appearance. All windows are of shatter-proof glass.

All cars are insulated for heating and air-conditioning, while the windows are of doubled glazed construction to further reduce heat losses. Thermostats control both the steam heating and the air cooling systems.

# Get H.O.T. On Welding

**By H. O. T. RIDLON**

### A "Hot" Tip or Two

Well here I am in Chicago for a day or two seeing the big boss and things after attending the Purdue Welding Conference. It sure was a grand show with lots of things to see and learn. I saw a new low-temperature brazing alloy—something real new for brazing the copper alloys. It sure looks like the nertz to me. And by the way, the brazing of copper and its alloys is something that is coming faster and faster upon us. Better wise yourself up on it Son.

Also, the same company was showing a new hard-surfacing material that looks mighty hot. And they sure claim a lot for it. I really don't remember the name of it, but I hard-surfaced a plow share with it while there and it really went on swell. Of course, I never claimed to be the best welder in the world, because I make my living—now at least—by the sweat of my jaw bone.

My grand friend Ogden was there also. As you know he makes a rod for welding die castings, white, or pot metal as the "stuff" is often called, among other names. Anyway he was telling me that this year the use of white metal had increased in the automotive industry a great deal. It seems to me he said something like 50 per cent. He said he got his figures from a well known magazine. This should give you a picture of the importance of knowing how to weld white metal, and having the right kind of rod on hand, because there will be more and more of this welding from now on, so the thing to do is to be sure that you are ready to cash in on some of these extra profits. Because it can be successfully and economically welded.

As you know those light bulbs don't stand up worth a damn on the old extension cord when a spark drops on them. In fact that little item sometimes runs pretty high in some welding shops. Being as I haven't time to draw you a picture of what I have in mind you'll have to try and get my word picture. A very simple way to overcome this trouble is by taking a piece of light sheet metal and bending it into a half circle. On one end rig up a light socket—or your old drop light—so that you have a nice snug fit. Weld a piece of sheet metal to the other end. Now the top side should be an opening about 4 by 8 in. Fix this so that you can either slip in, or clamp to it securely, a plain piece of window glass about 4 in. by 8 in. You'll be surprised how many light bulbs you'll save during the year with a jigger like this.

### Tire Chains

Tire chains hard-surfaced last much longer than new ones. And believe you me Mister tire chains for large tires cost real bucks. It's a swell idea to sell to a contractor, fire department, or motor freight outfit this time of the year. You'll find that usually they're so durned pleased with it that they'll be bringing you all their work, and often they'll bring you all sorts of things to be hard-surfaced, scoop shovels and what not. I've found that the best way to hard-surface tire chains is after they have had a little wear. So you know where the wear is going to be on them.

Get a rod that not only will stand the wear, but also take a certain amount of shock. I prefer to do the job by the oxy-acetylene method using X Brand* self-hardening rod. Don't forget to go after your county highway department to hard-surface the blades on their snow plows. It looks like it was going to be a long hard winter with lots of snow.

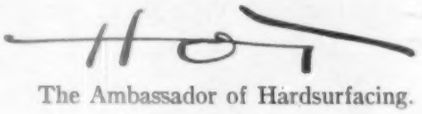
Really you should have gotten this suggestion last month, but it still isn't too late to let the folks know—by broadcasting the fact one way or another—that a lot of the old metal toys they have kicking about the place can be made to look and work like new with a little welding and a coat of new paint. That the younger brother and sister can use for a long time to come, or some poor kid in the other end of town would get a great thrill out of having all fixed up. And although these are usually small jobs that take only about ten minutes to do, you'll find it very profitable business at 50 cents or more a job—for you can really bat a lot of this kind of work out in a day when you get at it.

### A Hot Spark

Advertising and sales promotion in business is what a supercharger is to an automobile. You welding shop owners that want to increase your business for 1938—and who doesn't—will do well to plan an advertising program for 1938. If you don't know how to do it, I'll do it for you—for a very modest fee of course and I'm not fooling—because I've had a lot of experience doing such things. So if you want help write me about yourself, your shop and a picture of it, your portable equipment etc., and the territory you are serving, and how much dough you will spend each month. And tell what you have been doing to get more business and then I'll write you more about it personally. Write to me at 359 Park Ave. West, Mansfield, Ohio.

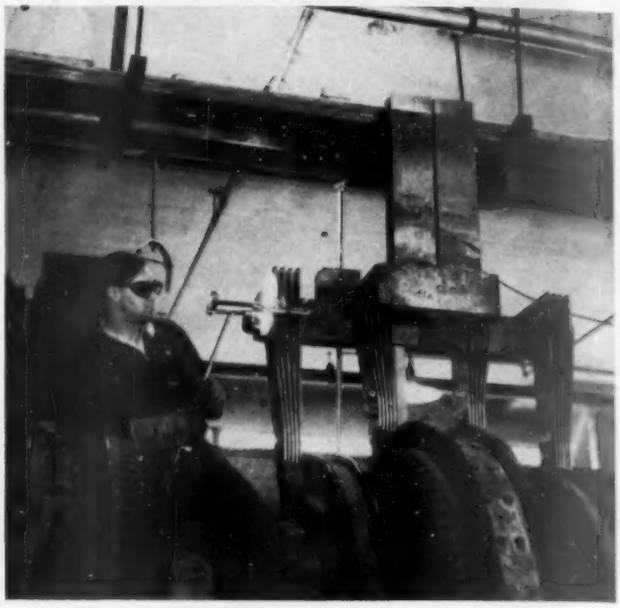
No more "Thought for the Month." The new editor thinks they haven't any place in a welding magazine. So I can but say a Merry Christmas and a Happy New Year to you, and I mean you.

As Always,



The Ambassador of Hardsurfacing.

*H. O. T. Ridlon will be glad to tell you his brand preference, if you will drop him a letter. —Editor.



Brazing a pair of bus-bars—Because of the large mass of copper, each joint must be made separately, working outward from the inside joint.

Pioneer application of low-temperature alloy for

# Brazing Of Copper Bus-Bars

★ Higher electrical conductivity achieved with large saving in cost of bus-bar joints

**By R. A. GOELLER***

**Vice-President, Hatzel & Buehler, Inc., New York City**

IN A RECENT OPERATION at the Brooklyn conduit plant of Steel and Tubes Inc., a subsidiary of Republic Steel Corp. we were employed to install over 20 tons of copper bus-bar on what is reported to be one of the largest electro-galvanizing plants in the country. This installation was brought about by the necessity for expansion of present facilities, and the engineers of Steel and Tubes, Inc., wanted to provide a process that would turn out a superior and uniform product throughout the life of the plant.

A factor in this accomplishment was the installation of a bus bar system capable of delivering about 36,000 amp. at 4 to 5 volts. It was extremely important that the type of bus bar joints used should offer a minimum of resistance to the passage of this high current and also that maintenance should be reduced to the lowest possible minimum under severe operating conditions.

To convey heavy currents to points of use in power plants, sub-stations, electric furnaces and other industrial applications, it is necessary to resort to larger cross-sections of copper than are generally available in wire. Rectangular copper strips or bars, known as bus bars, are frequently employed for this service.

It has been common practice to join bus bars by mechanical means, using clamps or a bolted joint. To provide sufficient contact area between connecting bars, it has been customary to lap the bars for a distance at least equal to their width. The adjoining faces of the lap have to be carefully faced and thoroughly cleaned before the joint is made up. Unless the joints are carefully maintained, they may become oxidized. Copper oxidizes rather rapidly at room temperatures and this action is much more rapid when the joints in the bars are subjected to a daily heat cycle as often happens under operating conditions. The film of oxide formed offers appreciable resistance to the passage of electricity with the result that the voltage drop and heating increase at the joint. When these factors become excessive, the joints must be disconnected, recleaned and reassembled.

With the heavy operating currents of this installation, the joining of the bus bars was an all important problem. To avoid deterioration from oxidation and the resultant voltage drop, a combination soldered and bolted installation, using drilled holes, was specified. Due to the estimated cost of soldering the joints, some of which were made up of 8-6 in. x ½ in. bars, the figures submitted on this basis ran considerably in excess of what had been anticipated. Soft solder in addition to bolting or clamping has been used in the past in an attempt to insure a permanent joint and eliminate maintenance costs. Due to the cost of this method, its use has been very limited in commercial installations. Furthermore, it has been the practice to use the same size lap as for unsoldered clamped or bolted joints.

*Presented at the 38th Annual Convention, International Acetylene Association, Birmingham, Ala., November 10th, 11th and 12th, 1937.

While designing the bus-bar clamps for this installation, having in mind the several problems, an idea struck us. Why not take a new departure in thought, and get out of the rut? Everyone in our organization agreed, but in what direction should such new paths lead? It was natural that electric welding should come to mind first, and pursuing the thought further, we found that portable equipment of several types was available, but not of the required capacity for this job. The cost of special equipment and the time required for its manufacture made us abandon the idea. The fact that one path had been closed, left us undaunted, and now that we had broken away from convention in thought at least, we were not going to give up because of one set back.

### Request for Help

Instead, we decided to investigate the possibility of either welding or brazing the joints. A telephone call to one of the manufacturers of oxygen, brought out that undoubtedly a perfect joint could be made by using a low-temperature brazing alloy. Their offer to send over an engineer to discuss the problem was accepted. The several types of brazing alloys available, their costs, methods to be used and equipment required were thoroughly discussed.

In regard to the lap for the joint, it was decided that three times the thickness of the copper would be sufficient as far as mechanical strength was concerned. In the 6 in. x ½ in. bus bar which size represented the greatest bulk, this meant a 1½ in. x 6 in. lap or 9 sq. in. of lap surface. How well this was justified both mechanically and electrically the following extracts from reports on tests will show.

### Tests of Welded Bus Joints

Necessary test pieces of copper were arranged for and several joints made in a laboratory with members of our staff present. Below is the report on the cost of brazing alloys, gas and actual time expended in making the joints.

No allowance was made for depreciation wastage, lost time, etc. In comparing the material costs of these test pieces, several interesting facts are evident. The brazing alloy cost is directly proportional to the area of the lap, regardless of the thickness of bar used. The cost of gases rises very rapidly as the mass of metal is increased. Larger tip sizes are used to bring local area up to proper temperature as soon as possible to prevent heat being conducted through the bar. The labor time is increased but this factor has no definite relation to mass since larger tips are used with larger masses of copper. During the tests, ordinary C clamps were used to hold the lap together during the brazing process, and similar clamps were employed in the fabrication of the job proper.

Fall-of-potential and tensile-strength tests were made of brazed copper bus joints. There were four joints tested, two joining ½ in. x 6 in. copper busses and two ¼ in. x 4 in. busses. The joints were arbitrarily designated Fig. 1, 2, 4 and 5 respectively, the straight sections of bus were designated No. 3 and No. 6 for the large and small sizes respectively. The following tests were made:

1. Fall-of-potential measurements along 12-in. sections of bus both including and excluding joints.
2. Tensile-strength tests of one joint of each size.

For the purpose of comparing the resistance of each joint and a length of bus, all the joints and lengths of each size of bus were connected in series. The ends of the assembly were connected to a low-voltage, heavy-current, d-c. generator. The current was measured by a calibrated ammeter and shunt. The current was adjusted to 1,500 amp. by varying the generator field current. The fall-of-potential across a joint and along a section of bus was measured with a null-type potentiometer.

The tensile strength was determined in a standard tensile machine of 200,000 lb. capacity. The time from zero load to maximum was approximately 5 min.

### Results of Tests

Fall-of-potential at 1,500 amp. was as shown in Table 2.

The current was maintained at 1,500 amp. for about one hour. The temperatures were not constant and no effort was made to prevent heat flow from one section to another. The temperature was slowly rising during the test period.

Tensile tests were made on joints No. 1 (½ in. x 6 in. x 1½ in. lap) and No. 4 (¼ in. x 4 in. x ¾ in. lap). The breaking loads were 68,500 lbs. and 24,900 lbs. respectively. There was no definite indication of the yield points.

(To Be Continued Next Month)

**TABLE 2—Fall of Potential Tests on Brazed Joints**

| Test No. | No. Size of Bus | Length of lap, (in.) | Fall-of-potential between points, 12 in. apart |
|---|---|---|---|
| 1 | ½ in. x 6 in. | 1½ | 4.0 |
| 2 | ½ in. x 6 in. | 3 | 3.7 |
| 3 | ½ in. x 6 in. | (bus) | 4.2 |
| 4 | ¼ in. x 4 in. | ¾ | 13.0 |
| 5 | ¼ in. x 4 in. | ¾ | 13.2 |
| 6 | ¼ in. x 4 in. | (bus) | 13.5 |

**TABLE 1—Material Cost of Brazing Test Bus-Bar Sections**

**¼ in. x 4 in. bar—¾ in. lap—Type 1 Alloy**

| | |
|---|---|
| Type 1 low temperature alloy used—¾ in. x 4 in. x 0.01 in.—0.15 oz. @ $3.50 per lb | $0.033 |
| Oxygen—No. 9 tip at 5 lb. sq. in. pressure 1.5 cu. ft. @ $1.60 100 cu. ft | 0.024 |
| Acetylene—No. 9 tip at 5 lb. sq. in. pressure 1.5 cu. ft. @ $3.15 100 cu. ft | 0.047 |
| Total material cost per joint | $ .104 |

Unit cost=$.035 per sq. in.

Labor time—Brazing 1½ min.—Cleaning, fluxing, assembling—3 min.

**¼ in. x 4 in. bar—¾ in. lap—Type 2 Alloy**

| | |
|---|---|
| Type 2 low temperature alloy used ¾ in. x 4 in. x 0.015 in.—0.2 oz. @ $3.80 per lb | $0.047 |
| Oxygen—No. 9 tip at 5 lb. sq. in. pressure 1.7 cu. ft. @ $1.60 100 cu. ft | 0.027 |
| Acetylene—No. 9 tip at 5 lb. sq. in. pressure 1.7 cu. ft. @ $3.15 100 cu. ft | 0.054 |
| Total material cost per joint | $0.128 |

Unit cost=$.043 per sq. in.

Labor time—Brazing 1¾ min.—Cleaning, fluxing, assembling—3 min.

**½ in. x 6 in. bar—1½ in. lap—Type 1 Alloy**

| | |
|---|---|
| Type 1 low temperature alloy used 1½ in. x 6 in. x 0.01 in.—.45 oz. @ $3.50 per lb | $0.099 |
| Oxygen—Two flame No. 10 tip—10 cu. ft. @ $1.60 100 cu. ft | 0.160 |
| Acetylene—Two flame No. 10 tip—10 cu. ft. @ $3.15 100 cu. ft | 0.315 |
| Total material cost per joint | $ .574 |

Unit cost=$.064 per sq. in.

Labor time—Brazing 3 min.—Cleaning, fluxing, assembling—5 min.

# Emergency Repair of 7½-Ton Shaft

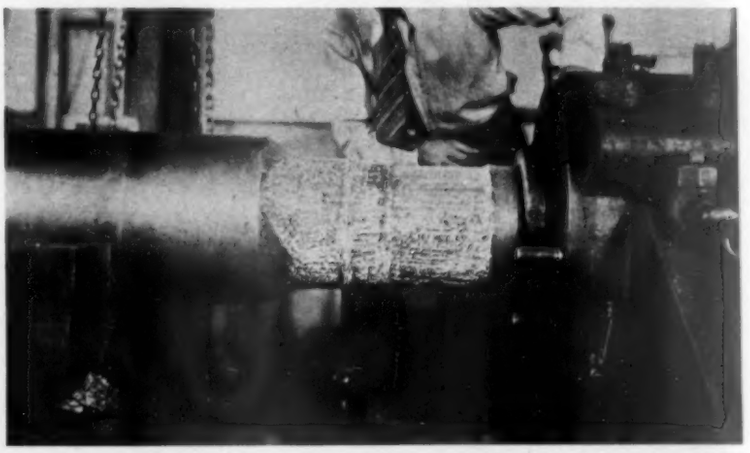
"LEAVE ON THE FIRST THING going to Rio." These words, transmitted by long-distance telephone from Rio de Janeiro to Sao Paulo, Brazil, ultimately led a sales engineer* to the city of Belle Horizonte where an emergency repair was made which saved the city's supply of electricity.

Normally, water turbines generated the necessary electricity, but water supply for the turbines was low due to six months without rain. In an emergency, five 600-hp. motors were available to generate current. Even all five motors, operating at full capacity, could generate only approximately half the city's normal consumption. Consequently, when one motor went out of commission due to a broken shaft, a serious situation developed.

The job was particularly difficult for several reasons. In the first place the size of the shaft—27½ ft. long, 13 in. diameter, weighing 7½ tons and supporting a 12-ton fly-wheel—made handling a serious problem. Secondly, lack of equipment made it necessary to improvise repair apparatus. Thirdly, the irregular size of the shaft—larger at one end than the other—created a problem of maintaining a heat balance in the part during welding. Finally, there was opposition on the part of various individuals to welding the shaft. These obstacles, however, did not prevent carrying the job through to a successful conclusion and with savings of over $4,000.

As a beginning, the two pieces of broken shaft were removed, (the work taking 36 hours), and the broken part of the shaft cut away. This done, the short piece of shaft was placed on end, a platform built around it and the welding started. Welding continued without intermission for 14 days and 14 nights, using 3/16-in. electrode with 205 amp. at 33 volts. To keep the work cool during welding, a funnel of 2-gal. capacity was made to fit snugly around the pipe. A hose was connected to the funnel, also a waste pipe to carry away the water which was maintained within approximately 6 in. of the welding.

When the welding of the short section of shaft was approximately half done, the other section was placed on end, built up by welding and cut to a wedge shape. This done, both pieces of shaft were put back into the bearings. The two V's were checked and found to be in perfect shape and position for welding. The angle of bend was approximately 60 deg. with a top opening of practically 9 in. Welding the two ends together continued for 6 days and 6 nights. When the job was about 2/3 completed, a crack appeared in the shaft about 2 in. above the level of the last bead.

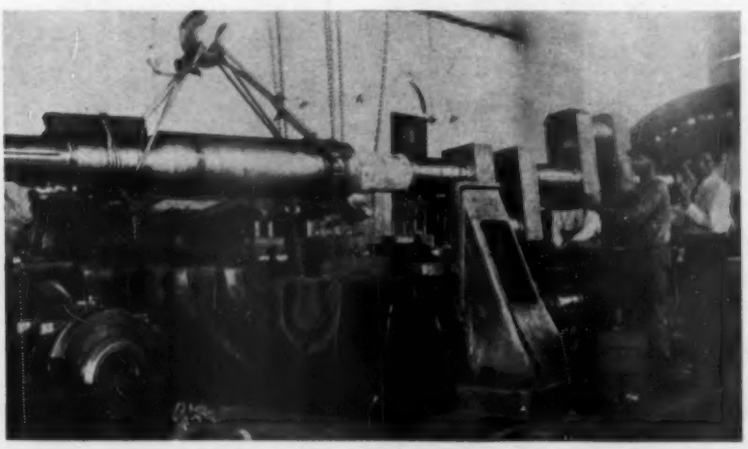


**Close up of the welded shaft which presented considerable difficulty due to dissimilar sizes of shaft (33 centimeters and 24 centimeters).**

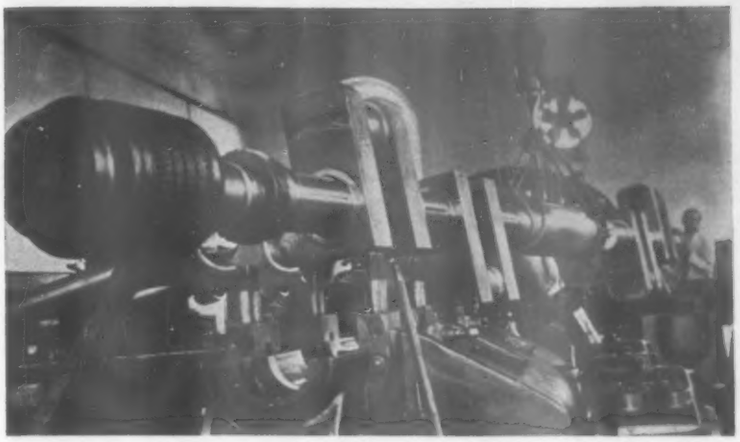
Less persistent workers would probably have given up at that point. Despite very close examinations by every means of crack-finding—magnifying glasses, fillings, etc.—the one crack had not been discovered. To reach the bottom of the crack, saws and chisels were used for 14 hours. When the bottom was finally reached, the shaft was in a shape that would not permit effective use of welding. It was then necessary to cut away the other half of the weld in order to do the job and have the shaft in perfect alignment when finished.

But persistency won out. The men did not stop. They worked 36 hours lining up the shaft preparatory to resumption of welding. In the meantime a fixture was made to clamp the

*Mr. Alpha Jewell of the Sao Paulo, Brazil, office of the Armco International Corp.



**Repairing a broken 27½-ft. shaft of an emergency 600-hp. motor at the Bello Horizonte, Brazil, shops of Electric Bond and Share Co.**



**Finished drive shaft after heavy welding repair which saved over $4,000.**

shaft so that a pressure of two tons could be brought to bear on the weld. The fixture consisted of two bolts, one-inch in diameter by 36 in. long, at each end of the shaft and fitting into the holes in the frame.

With the above described equipment rigged up, welding was resumed. A bead was run on one side, then on the other with the shaft turned over. After 6 days welding, a crack developed about ½-in. from the line of fusion due to the irregular size of the shaft—33 centimeters diameter at one end and 24 centimeters at the other. In spite of every effort to maintain a balance of heat (by using wet sacks, waste, etc.), the smaller end heated and cooled more quickly than the large end.

This crack made it necessary to cut the weld out again. This time, instead of cutting the ends to a V-shape with two faces, they were cut so as to make four faces. A length of 3-in. square stock was placed in the center and a bead of weld metal run on each face as the shaft was turned by means of a crane. For the welding, heat was kept very low—averaging 25 deg. to 30 deg. With this low heat, the welding was necessarily slow and 21 days were required to complete it. For reinforcement, the shaft was made one-inch oversize where the two ends were welded together.

The final layer of weld metal was applied with 5/32-in. rod in order to leave a perfectly smooth surface. "Fleetweld 5 in. electrodes and a 200-amp. "Shield-Arc" welder, manufactured by The Lincoln Electric Company, Cleveland, O., were used for the welding. The work required 600-lbs. of weld metal. The shaft was checked for straightness and found to be only 1½ millimeters out of true.

The persistence of the men on the job saved over $4,000. A new shaft would have cost $5,300. The repairs, made with electric welding, in spite of obstacles, disappointments and setbacks, cost only $1,000. The successful conclusion of the job restored the much-needed 600-hp. motor to service.

## Launch New Welded Oil Tanker

The launching at the Sun Shipyards, Chester, Pa., of The Atlantic Refining Company's new tanker, the "J. W. Van Dyke," added to the American merchant marine an oil carrier which is the world's largest welded ship and the first American-built turbo-electric tanker. Her dead weight capacity is 18,500 tons; her displacement at loaded draft is 23,898 tons. Cargo capacity is 6,552,000 gallons. This

**World's largest welded cargo ship.**

was described in the November, 1937 issue, pages 36-41.

Turbo-electric engines, developing 5,000 hp. will give the ship a speed of 13.25 knots enabling her to make the trip between Philadelphia and Texas Gulf ports in the unusually fast time of six days. Pumping equipment will make possible the discharge of cargo at the rate of 630,000 gallons an hour, approximately three times the usual discharge rate.

Construction of a welded tanker is not a new departure for the company. In fact Atlantic was one of the pioneers in this field. One of the first all-welded, self-propelled vessels to be built in this country was the "White Flash," a tanker with a length of 201 ft. 2 in. overall, a beam of 34 ft. and a cargo capacity of 315,000 gallons. The contract for the "White Flash" was placed in November, 1930. This was followed three years later by a twin ship, the "Franklin." Both ships fully lived up to expectations and demonstrated the practical value of substituting welding for riveting.

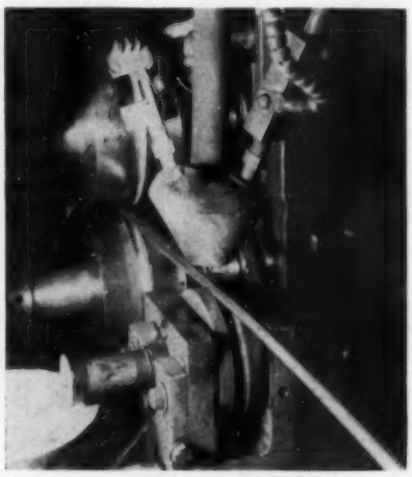
## Atomic Hydrogen Welding Equipment

When considering the manufacture of metal tubing, a large midwestern manufacturer surveyed available processes and came to the decision to employ atomic hydrogen welding equipment as an essential part. The tubing produced with this equipment is very clean, smooth and free from oxidation.

The atomic hydrogen welding process is used to weld the seam of ⅜-in. nickel alloy tubing. After it is cut into 20-ft. lengths and cleaned with a hydro carbon of low flash point to remove all trace of compounds used in the forming process, the tubing is inserted into a power feeding machine upon which the atomic hydrogen welding head is mounted. The tubing is moved forward at a constant rate by a set of driven grooved rolls at each side of the welding head, directly under which is an adjustable grooved idling roll. A knife roller in front of the first power roll keeps the seam of the tubing in the proper position. To reduce end losses, the lengths of tubing are joined together just before entering the power rolls.

The welding head, which is adjustable in all directions, contains a fan-shaped electric arc inside of a hydrogen flame. This arrangement of arc

and flame is obtained by maintaining a single-phase alternating-current arc, between adjustable tungsten electrodes and feeding hydrogen gas to the arc. Molecules of the hydrogen are broken into atoms by the intense heat of the arc and, in recombining outside of the arc, give off tremendous heat. This heat is used to join the sides of the tubing as it passes through the welding head and results in a high welding speed. The welded seam is scarcely noticeable either inside or outside of the tube.



**Atomic hydrogen welding head used for seam welding of ⅜-in. nickel alloy tubing.**

Samples of all tubing welded by this process are rigidly tested by hydraulic pressure and are severely flared and flattened to check the strength and toughness of the weld. Scrap from all causes does not exceed six per cent and often runs as low as two per cent.

Atomic hydrogen welding is claimed to have several features which make it well suited to production welding. Hydrogen, being an active reducing agent, prevents formation of oxides and hence produces a strong, smooth, ductile weld. Metal welded by this process is not in the electrical circuit and need not be grounded or insulated. Since the atomic flame is constantly maintained, welds made by this process are said to be highly uniform.

## Welder Flexibility — Plus

Rosselle's, Inc., one of the leading welding shops in Miami, Fla., reports a shop-built 200-amp. engine-driven welder which is very unusual both from the viewpoint of construction cost, operating characteristics and range of use. The basis of this highly portable machine is a new 200-amp. 1750 r.p.m. P&H-Hansen Smootharc welding generator, purchased from the Ward Engineering Co. of Jacksonville. This generator was mounted upon a home-built frame with pneumatic-tired wire wheels, and connected up with a discarded Ford Model A motor. The entire mounting, including the motor, cost less than $40.

**Welding generator supplies power to portable drill and grinder**

Mr. Rosselle has incorporated in this device something that doubles the value of his gasoline-driven welder. He has connected across the terminals of the welding generator a permanent set of leads which are carried to a regular outlet box, equipped with a standard Edison receptacle mounted on the panel between the engine and the generator. Into this receptacle he plugs a standard electric drill or grinder connection to give him a very efficient source of power.

The high circuit voltage of the generator is ideal for operating grinding or drilling tools, and has enabled Mr. Roselle to build a portable unit that has already justified its cost from the standpoint of the drilling and grinding operations alone. The Model A Ford motor operating at 1750 r.p.m. does "a wonderful job with ¼ in. coated rod on continuous work without any signs of overheating."

## Gas Welding on Giant Gasoline Tank

A welder in the shop of the Boeing Aircraft Company, Seattle, Wash., is shown finishing a precise job of oxy-acetylene welding. The tank shown is one of six immense fuel reservoirs that will be installed in each of the 72 passenger transoceanic Clippers now under construction at the Boeing plant. The huge tank is built of aluminum alloy and is one of a pair that will be housed in the great 152-ft. wings of the Clipper. It is about 9 ft. long and holds 600 gallons.

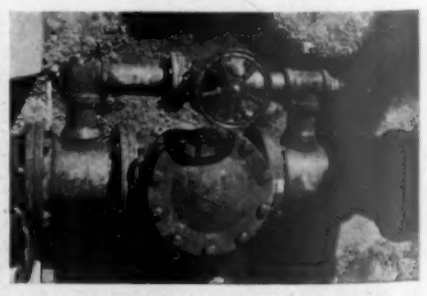
Four other gasoline tanks even larger than this one, holding 750 gallons each, will be built as an integral part of the hydro-stabilizers on the Clippers—the short stub-wings which ride the water during take-off and landing. Combined, the reservoirs will

**Welding huge 600 gal. fuel tank for transoceanic "Clipper" ship—An oxy-acetylene job on aluminum alloy.**

hold 4,200 gallons of gasoline, enough to give the two-deck flying boat a maximum range of about 5,000 miles with reduced payload, or more than 3,200 miles with 50 passengers aboard.

## Welded Pipe Fittings

There is a definite trend in pipe fabrication to more extended use of welding, thereby eliminating cost of cutting, threading and fitting of pipe. A recent example on a fire extinguisher system at the plant of the Southern Cotton Oil Co., Savannah, Ga., has been called to our attention. Bonney Thred-O-Lets (10 in. by 4 in.) were welded on the by-pass valve of a 100,000 gal. water tank. The bottom of this tank is 100 ft. above ground. A 36-in. line runs from the tank to ground. Georgia Supply Co., Savannah, Ga., sent us the photograph.



**Welded fittings on by-pass valve**

# Cutting Down Truck or Tractor Wheels for Pneumatic Tires

In changing truck wheels from solid to pneumatic tires, or in cutting down tractor wheels for pneumatic tires, a common job for the welding man located in farming communities, the welding and cutting process has been found very helpful. The rims to accommodate pneumatic tires are manufactured separately and the common practice is to remove the old style solid rim by cutting off each of the spokes as near as possible to the rim and welding a new type rim in place. The repair man will find that oxy-acetylene cutting will produce a satisfactory solution to the problem, the blowpipe being used to make the cuts at the ends of the spokes.

In some instances, it is found advisable in removing solid tires from truck wheels to cut the rim on both sides of each spoke. The ends of these are then shaped and machined to the correct size to fit the rim. Another way is to use a smaller rim. The spokes are cut down to fit it and the larger size of the pneumatic tire makes up to the deficit in length of the spoke. Fig. 1 shows the hubs and spokes of some wheels which were cut off for this alteration. Bronze-welding has been found very satisfactory for joining the spokes to the outer rim in the final operation.

This method eliminates preheating, which might otherwise be necessary on account of irregular distribution of heat in welding the ends of the spokes to the rim. Fig. 3 shows two completed wheels which were remade by cutting the spokes and bronze-welding new rims. Re-equipping the truck with pneumatic tires cost this welder only about 1½ hours' time with the oxy-acetylene cutting blowpipe and the price of new rims.

One firm engaged in the manufacture of tire rims has made use of machine cutting methods in this re-equipping process. Their business brought to them for new rims many different types and sizes of automobile truck wheels. They finally found it necessary to find some means of using oxy-acetylene cutting on the varied types, in a manner which would give clean cuts in the shortest possible time. It was found that hand cutting methods could be improved upon and costs cut down to a minimum by having a mechanism which would remove as little as possible of the spoke and thus give a correct fit to accommodate the rim for pneumatic tires. Considerable milling and machining could also be eliminated by making smooth cuts in the ends of the spokes.

A jig was devised to accommodate all types of wheels, and thus gave a practical solution to the problem. The jig was of very simple construction and required but little time to fabricate. The base was made up from an old brake drum and three steel supports which were welded together, to form a sort of three-legged stool. A truck wheel is placed on this, the steel shaft is dropped through the hub and then a cone fastened to the under part of the wheel by a nut on the threaded end of the shaft. Another cone is dropped on the shaft and tightened to the wheel. The upper cone corresponds to the size of the hub, thus insuring correct centering of the wheel on the jig. Lastly, the arm carrying the cutting blowpipe is dropped over the shaft and the cutting device is ready for operation. The blowpipe is lighted and the shaft is revolved by hand. The cut is made as near as possible to the old rim. With the jig the cuts are always made at equal distance from the hub and there is no distortion when the new rim is welded on.

This cutting jig operates efficiently and has greatly reduced costs. It has

FIG. 4—Cutting off the rim with the aid of special jig

FIG. 1—The rims cut off

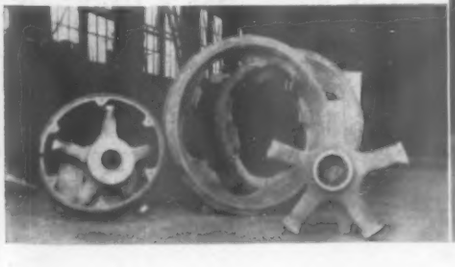


FIG. 2—Essential components of the jig

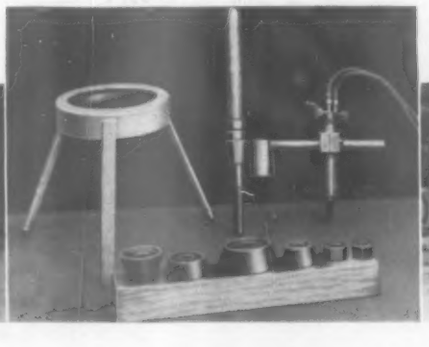
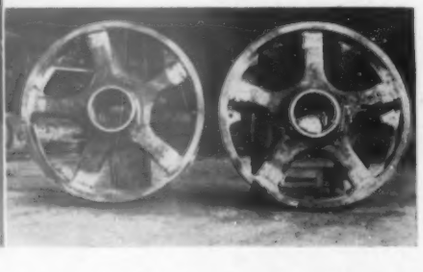


FIG. 3—Completed wheels welded to new rims



also enabled the tire rim manufacturers to handle more jobs with a promise of quicker delivery to the truck owners. Fig. 4 shows the cutting jig in operation, the operator watching the cut and guiding the blowpipe.

# Obsolete Plant Wrecked By Carbon Arc

By E. J. LAWRENCE

Welding Specialist, Westinghouse Electric & Mfg. Co., Chicago

The electric arc has long been used in the fabrication of steel buildings and structures, but its use in wrecking steel buildings is new. The Central Illinois Power, Light & Gas Co., Peoria, Ill., had a 3-story steel building, 200 ft. long by 100 ft. wide and a gas storage tank of 30,000 cu. ft. capacity that they wanted to dismantle in favor of more modern structures. In planning the wrecking operation attention was directed to the availability of free electric power and the general contractor, Daniel J. Mahoney Co., Pekin, Ill., decided to use the electric arc.

**In demolition job on this old plant, use was made of the carbon arc—A 400-amp. generator with 500 ft. cables was used**

It was recognized that the electric arc was inferior in some respects to the oxy-acetylene blowpipe for cutting steel, because arc cutting is essentially a melting operation which leaves no well-defined edge, whereas the oxy-acetylene torch produces clean cut edges. However, on this particular job it was not a serious objection because the surface condition of the salvaged steel was a matter of only secondary importance.

In selecting the welding machine to be used definite arc characteristics were sought to meet the conditions on the job. The operator on most of the work was located at considerable distances from the welding machine which made it inconvenient and also cost him considerable time if he had to return frequently to the machine to make adjustments to secure a particular heat. To meet this condition and to speed up the work a machine with a long arc, exceptionally steady current, and a device for accurately pre-selecting the desired current was selected.

The machine selected was a 400-amp. Westinghouse motor-generator type FlexArc welding machine. It was centrally located with respect to the wrecking operations and was connected to the power line through a 200-ft. cable. Welding cables 500 ft. long were used which made it possible to work on any part of the building without moving the machine.

Carbon electrodes of ⅜ in. and ½ in. diameter were employed with arc currents up to 500 amp. The welding machine carried this load without overheating. Much of the steel was coated with paint and tar but this proved to be of little hindrance to the work as it was necessary to scrape only a small spot in order to strike the arc.

Eight hundred tons of steel and cast iron were cut out of the building and gas storage tank. Sections cut ranged from ⅛ in. to 2½ in. thick consisting of I-beams, trusses, steel flooring and equipment supports of all kinds. Part of the equipment dismantled consisted of a 400-ft. pipe line, 5 ft. in diameter, mounted on 40-ft. standards.

No detailed records were kept on the cost of cutting per linear foot, because of the wide variety of shapes and thicknesses encountered. However, the overall cost of the wrecking operation compared very favorably with the calculated costs.

## Welded Trains in England

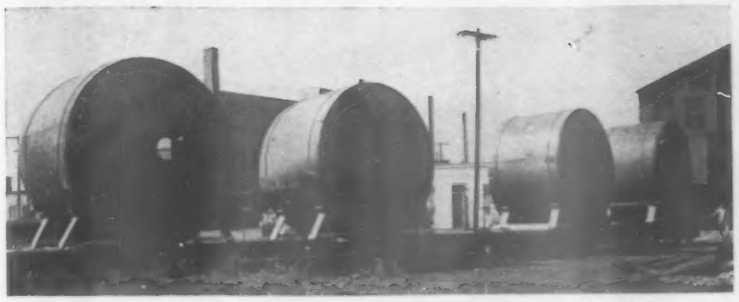
Welded steel construction will be used on new English trains. By the use of high-tensile steel with articulated construction it has been possible to secure a reduction of 55 tons in weight for a long distance tourist train which will soon be used on the railways of Great Britain. The train is to be made up of 10 cars having a total capacity of 529 passengers. The body of each coach is welded to the underframe so as to form one rigid structure.

**Arc welding side sheets on new lightweight coaches**

## Welded Stainless Steel Tanks for Chemical Plant

The stainless-clad steels since their development, have found wide use in chemical plants on account of their resistance to corrosion, permitting storage of active reagents without the danger of contamination or pitting. With the development of steels of this character, it was also necessary to perfect some method of fabrication which would give a container without seams where leaks might develop.

The tanks shown in the illustration are 13 ft. 6 in. dia. by 20 ft. of ¼ in.



Two of the sections shown above are required to make one tank—Each section is made up of eight plates

wall. It takes two of the sections shown to make one tank, the circumferential weld being made during field erection. Each section was made of eight plates, thereby calling for less than the normal amount of welding, according to Alloy Fabricators Inc., Newark, N. J. who handled the work. This method required greater skill in shop fabrication and field erection.

Plates are 18-8 stainless steel clad with electrically welded seams made by a process said to be exclusively developed and used by Alloy Fabricators Inc.

As mounted on the cars the tops of the tank sections were 17 ft. 1 in. above the rail, which necessitated special handling arrangements during transportation.

## Consolidated Edison Welds Steam Lines

One of the largest welding jobs of its kind, the boilers and high-pressure steam lines of the new 1200-1400 lb., 900 deg. F. topping turbine for the Waterside Station of the Consolidated Edison Co. of New York, were welded with a battery of 32 Westinghouse FlexArc welders. The job was an ex-

FIG. 1—Welded joint on 14 in. carbon-molybdenum alloy steel pipe

FIG. 2—Preheating and annealing arrangement for welding 14 in. piping—Resistance wires hold pipe at 600 deg. F. during welding

acting one and required that the pipe area on each side of the joint be preheated, before a weld was started and annealed when completed. Each weld had to undergo an X-ray examination.

The enormous stem pressures and high temperatures that these lines will carry when finished makes it necessary to give the welding operators special instructions and tests before being qualified to work on the pipe joints. The main steam pipe is carbon molybdenum alloy steel for which special welding rod was used.

## Welded Water Syphon

The Economy Welding Service of Omaha, Neb., recently completed the welding of a multi-plate syphon for the Tri-County Power and Irrigation Project near Holdrege, Neb.

The syphon, fabricated from ¼ in. corrugated galvanized iron is claimed to be the largest of its kind, 290 ft. long and 14 ft. in diameter. All joints were bolted and welded on both sides, with bolts and nuts welded. There was approximately 15,000 lineal feet of welding, requiring three weeks of working time, four shifts, six hours each, a day to complete the job.

The welding was done with Hollup Sureweld electrodes, using three portable Lincoln welders. It is said that fabricated metal syphons of this type will be used more in the future.

Water syphon, 14 ft. in diameter was fabricated by welding ¼-in. corrugated galvanized iron sheets

## Ship "Surgery"

Keeping many a vessel from the graveyard of ships by mending broken or worn parts of hull and propelling machinery, the modern ship's doctor "heals" the injured stern frame of the cargo ship "Alabaman" of the American Hawaiian Steamship Co. at the Oakland, Calif. yard of the Moore Drydock Co. The ship's doctor (arc welding operator) "sews up the wound" with the electric arc using molten shielded arc weld metal from "Fleetweld" electrodes.

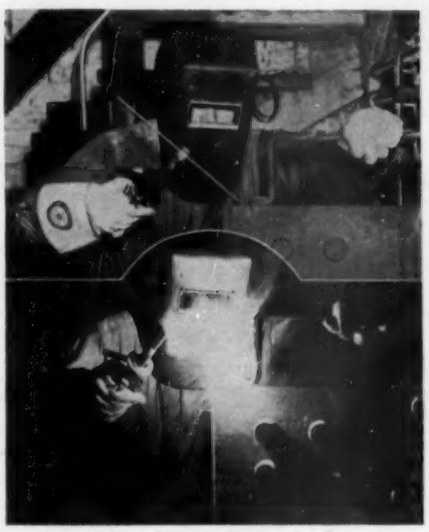
Repairing section of stern frame

# New Equipment Developments - - -

## Arc-Welding Helmet Has Movable Filter Glass

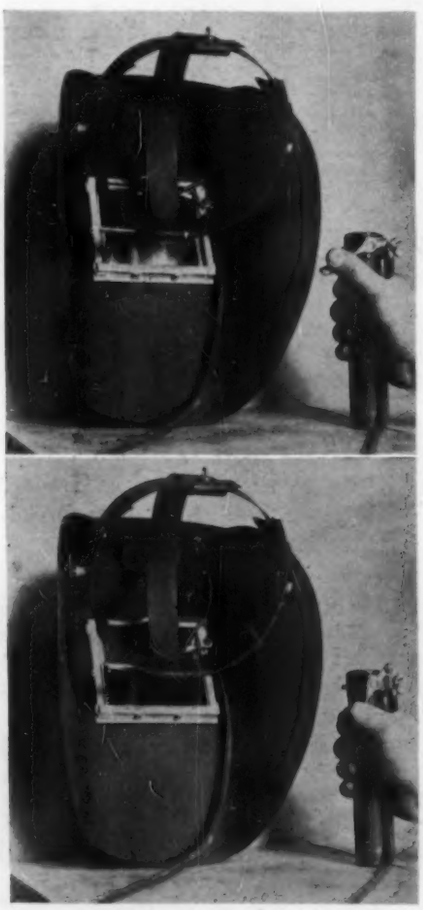
The arc-welding helmet in common use is hinged to a circular head band, allowing the helmet to be tipped up and down. Because of the dark protecting window in the helmet, the operator pushes it up off the face while placing the electrode on the proper spot for the work. Then with a shake of the head, the helmet falls down in front of the face and contact is made.

To overcome this momentary removal of the eyes from the work, and the consequent possibility of error in placing of the electrode, the inventor of this new helmet, has devised a sliding dark window, which actuated by a cable similar to a camera release, drops down behind a clear window. This release is operated by a lever fastened to the electrode holder, which is actuated by the welder's thumb, thus allowing him to keep his eyes fastened on the work until the moment of contact, also leaving his left hand free at all times.



**Top—Getting the electrode near the work, operator can look through the clear glass; Bottom—Striking the arc, with dark filter glass dropped down.**

Another advantage of the helmet is the easy replacement of the protecting plain clear glass which becomes pitted and scarred very quickly from the sparks issued by the arc. The inventor of the new helmet is Richard Ingwersen, of the Universal Brush Co., 40th St. and Packer Ave., Chicago.



**Top—Dark window up in a position to strike the arc; Bottom—Dark glass has been dropped by depressing the thumb lever on electrode holder.**

## Lincoln Electrode for A-C. Welding

A new mild steel arc welding electrode, designed particularly for use with small a-c. transformer type arc welders, which is said to simplify welding with this type of equipment and provide weld metal of high quality, is announced by The Lincoln Electric Company, Cleveland, Ohio.

The new electrode, designated "Transweld," is the result of research on the part of Lincoln engineers to develop a rod which would meet the special requirements of small a-c. transformer welders.

"Transweld" has a very heavy extruded coating and, unlike ordinary electrodes used with small a-c. welders, has a very stable arc, easy to strike and hold. Because of its stable arc the electrode permits making welds in smooth well-shaped beads. Another advantage is that slag is easily removed from "Transweld" deposits.

Weld metal produced by the electrode possesses high physical properties. Tensile strength is 75,000 to 85,000 psi., yield point 60,000 to 68,000 psi., and ductility is 20 to 30 per cent elongation in two inches.

"Transweld" is suitable for making all types of welds in flat, horizontal, vertical or overhead position. The electrode operates equally well with direct current of either straight or reversed polarity. "Transweld" is made in three sizes: 3/32, 1/8 and 5/32 in. The smaller size comes in 12-in. lengths, the other two in 14-in.

## Device for Determining Gas Concentrations

Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh, Pa., recently placed on the market the M. S. A. Explosimeter, a pocket-sized instrument for quickly and easily determining the presence of combustible gas hazards. The M. S. A. Explosimeter is designed to meet the demand of operating men for an instrument that can be carried about on the job and operated by any workman. It shows whether gas concentrations

**For detecting presence of combustible gas hazards.**

are within or above the explosive range. In size and weight, the unit compares with a small folding camera, and can be carried either in a pocket or on a shoulder strap.

Dependability, compactness and easy operation give the Explosimeter a wide range of application, it is claimed. Some of the fields in which it is now being used include: distilleries, public utilities, oil refineries, paint and varnish plants, iron and steel mills, chemical by-product plants, etc. It is especially well adapted to use by municipalities for investigating fire hazards, testing sewers, manholes and checking for gas hazards in sewage disposal plants. Where an explosion hazard exists in welding tanks and containers, the new instrument should be a good safety first tool.

Copies of a well illustrated bulletin on the M. S. A. Explosimeter, just published, are available by addressing the manufacturer direct.

## New Torchweld Cutter Uses Variety of Fuel Gasses

Torchweld Equipment Co., 1035 W. Lake St., Chicago, announces a new cutting torch as an addition to their line of equipment. It is designed for use with a wide variety of fuel gases such as acetylene, propane, hopane, butane, pyrofax, hydrogen, coke oven, city and natural gas. A feature of the new unit is that only one of two mixers is required for using any available gas. These accessories can be easily identified and quickly put into the torch where provision is made in the head. It is indicated that with this unit and the extra tips and mixers, it is possible to move around a plant and use any of a variety of fuel gases which are available. It is also pointed out that no booster pumps are required for gases such as city, coke oven or natural gas.

Construction of the new unit incorporates a drop forged head which is brazed to the three monel metal tubes so as to eliminate largely the possibility of leaks. Valve seats, it is pointed out, are of metal-to-metal construction. Another point featured is the mixer in the head which makes possible simplification of construction. Easy cleaning is possible when the need arises, since the tips are fluted and are of two piece construction.

Units are furnished with two mixers and one set of four tips for any specified gas. Either 75 or 90 deg. heads are available with a choice of bottom lever or trigger type high pressure oxygen valve. The trigger type is designated No. 29 MC and the lever type No. 29-1 MC. Full details of operation and price can be obtained by writing the manufacturer at the above address.

**Cutting torch designed to utilize a wide variety of fuel gases—No booster pumps are required.**

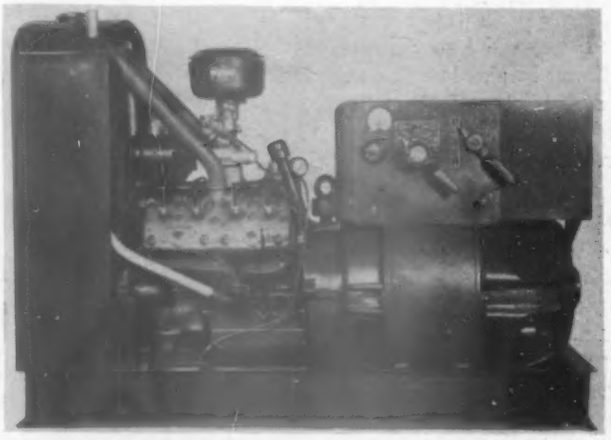
## New Portable Welder

A new, single-operator, portable welder, combining the improved Type WD-32B General Electric arc-welding generator and a standard 60-hp. Ford V-8 engine, has been developed by the General Electric Co. so that successful arc welding can be done independently of electric power service. Designated as Type WD-32BY, the new welder has a N.E.M.A. rating of 200 amp., 40-volt arc, 1 hour, 50 deg. C., 60 to 200 amp. welding range. The complete unit, 24 in. wide, 60 in. long, and 43 in. high, can be loaded crosswise into practically any truck body. Net weight is approximately 1250 lbs.

Features of the welder include self-excitation, duplex control, and self-stabilization. The heavy commutator on the generator furnishes reliable excitation without the use of any external exciter parts. Duplex control gives the choice of current and voltage adjustments that is essential to the best work under many varying conditions. The self-stabilization characteristic of the Type WD generator permits easy welding with any type of wire, either bare or shielded arc, and with any current or voltage adjustment.

Standard parts are used in both engine and generator, and ready accessibility makes maintenance easy. Ample power is provided by the engine, even at the conservative operating speed of 1750 rpm.—equivalent to a car speed of 31 miles per hour. Less than two gallons of fuel per hour will operate the machine at full load. Standard sets include electric self-starter, battery charging generator, oil-bath air cleaner, fuel pump, 10 gal. fuel tank, and vacuum speed governor. Optional features, available at additional cost, include electric slow-down control, crank case oil filter, waterproof tarpaulin, auxiliary 1 or 2 kw. 125-volt d-c generator, and a two-wheel pneumatic-tired, roller bearing running gear with trailer hitch.

A special design of coupling, particularly compact and durable, is used to connect the engine crankshaft to the generator. Torsional shock is decreased by this type of coupling and bearing strain is minimized.



**New General Electric engine-driven arc welder features self-excitation, duplex control, and self stabilization—Standard parts are used in engine and generator—Ready accessibility makes for easy maintenance.**

# News of the Industry

IOWA STATE COLLEGE OF AGRICULTURE AND MECHANIC ARTS, Ames, Iowa, announces that the annual Iowa State Welding Conference will be held March 22nd-24th, 1938. Program and arrangements are being handled by D. C. FABER, director of engineering extension service.

"PRESENT STATUS OF STRUCTURAL WELDING" was the subject of a paper presented by Professor WILBUR M. WILSON of the University of Illinois at the December 7th meeting of the Western Society of Engineers, 205 W. Wacker Drive, Chicago. Professor Wilson reviewed the welding processes currently in use, devoting major attention to the Unionmelt process now being used in a number of shops engaged in ship and barge building and railroad equipment fabrication. He pointed out that the "Unionmelt" process differed considerably in its operation from the usual shielded arc welding process. Professor Wilson then reviewed the results of research work conducted at the University of Illinois on the measurement of fatigue strength of welded structural specimens. Full details of this research work were presented by Professor Wilson at the last meeting of the American Welding Society which was held at Atlantic City, N. J., October 18th-22nd.

### D. & H. RAIL WELDING

The pioneer and also more recent installations of welded track on the Delaware and Hudson Railroad, were described by HERBERT S. CLARKE, engineer, maintenance of way, of the D. & H. at the November 12th meeting of the New York Chapter, Railway and Locomotive Historical Society.

The welding of rail into continuous lengths of a mile or more, making use of Thermit pressure welds and the flash welding process, was described as having very materially reduced maintenance charges, increased life of rails and resulted in smoother riding, among other advantages. During the current year, the Delaware & Hudson is welding into continuous lengths of a mile or more, 316,800 lineal feet of rail.

H. C. DRAKE, director of research, Sperry Products, Inc., Brooklyn, N. Y., described details of the Sperry flash butt welding of rails. A motion picture film showing installations of welded tracks on the Delaware & Hudson was also included in the program.

### OXY-ACETYLENE PROCESS DEPICTED IN NEW MOTION PICTURE FILM

"Modern Metalworking with the Oxy-Acetylene Flame," a new two-reel silent motion-picture film that depicts the construction and operation of oxy-acetylene torch and the oxy-acetylene process for joining and severing metals, is the latest addition to the film library of the Bureau of Mines, Department of the Interior.

Reel 1 illustrates how acetylene, the fuel gas for the oxy-acetylene flame, is produced by the chemical action of water and calcium carbide and how oxygen, the gas that supports the combustion of acetylene, is utilized in producing the oxy-acetylene flame of approximately 6,300 deg. F. By means of animated drawings and photography, every phase of the construction and operation of the "blowpipe," including pressure gages and adjusting screws, is shown graphically as well as the utilization of the oxy-acetylene flame.

Reel 2 illustrates the use of the oxy-acetylene process in cutting and welding metals, repairing damaged metal appliances, bronze-welding joints, welding pipe lines, and in the construction of all-metal automobile bodies. Scenes showing the use of oxy-acetylene cutting machines in shop and foundry practice and the flexibility, economy, and dependability of the oxy-acetylene process conclude the story of this tool of industry.

Copies of this film in 16-mm and 35-mm size may be had for exhibition by schools, churches, colleges, civic and business organizations, and others interested. Applications for the film should be addressed to the Bureau of Mines Experiment Station, 4800 Forbes St., Pittsburgh, Pa. No charge is made for the use of the film, although the exhibitor is asked to pay the transportation charges.

GOVERNORS OF 29 STATES have expressed interest in the $200,000 award program of the James F. Lincoln Arc Welding Foundation, according to a report of secretary A. F. Davis at a recent meeting of the Foundation's board of trustees, held at Cleveland, O.

Radical changes in methods of manufacture and construction, utilizing entirely new design concepts, are anticipated as a result of the large-scale redesign studies being stimulated by the award program. It was reported that redesign studies for arc-welded construction are being made of aircraft and automotive engines, railroad locomotives, naval and commercial vessels, industrial buildings and structures, as well as machines and products of all types used in industry, business and the home.

The award program, first activity of the Foundation's plan to encourage scientific progress of electric-welding, closes June 1, 1938.

THE 13TH ANNUAL PURDUE WELDING CONFERENCE which was held December 9th-10th had a registered attendance of 586, compared with the 1936 attendance of 537. As usual, the equipment demonstrations were crowded during the day and evening periods. Attendance at the technical meetings was very gratifying, the room being almost completely filled at each session. The following is a list of the companies which exhibited equipment at the Purdue Conference:

J. D. Adams Co., Indianapolis, Ind.; Air Reduction Sales Co., Chicago, Ill.; Aladdin Rod & Flux Mfg. Co., Grand Rapids, Mich.; American Brass Co., Waterbury, Conn.; American Optical Co., South Bridge, Mass.; F. W. Bollman Co., Lafayette, Ind.; General Welding Products Co., Indianapolis, Ind.; W. J. Holliday, Indianapolis, Ind.; Hammett Mfg. Co., Kansas City, Mo.; Harnischfeger Corp., Milwaukee, Wis.; Hobart Brothers, Troy, O.; Indiana Oxygen Co., Fort Wayne, Ind.; Lincoln Electric Co., Indianapolis, Ind.; Micro Products Co., Peoria, Ill.; National Cylinder Gas Co., Chicago, Ill.; C. E. Phillips & Co., Chicago, Ill.; Sellstrom Mfg. Co., Chicago, Ill.; Sutton-Garton Co., Indianapolis, Ind.; Tanner & Co., Indianapolis, Ind.; Union Carbide Co., (Haynes and Linde), Chicago, Ill.; Wayne Welding Supply Co., Fort Wayne, Ind.; *The Welding Engineer*, Chicago, Ill.; Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

OMAHA WELDING CO., 1501 Jackson St., Omaha, Neb., announces that on March 2nd-4th, 1938, it will sponsor a welding conference for the benefit of users of welding processes in the Omaha area.

INTERNATIONAL TRADES INSTITUTE, 741 W. 70th St., Chicago, announces a series of practical lectures every Thursday evening at 8 p. m. This series of lectures by welding engineers, instructors and metallurgists is designed for the benefit of welders who want to develop their knowledge of the subject and improve their technique. This school also announces a class in blueprint reading on Tuesday and Friday evenings, 7 to 9 p. m.

### CARNEGIE TECH—WESTINGHOUSE SCHOLARSHIPS

The establishment of a group of scholarships at the Carnegie Institute of Technology by Westinghouse Electric and Mfg. Co. as part of a cooperative engineering plan between the company and the college was announced recently by Dr. Webster N. Jones, director of the College of Engineering. These scholarships are in engineering, are undergraduate in character, and are to be known as the George Westinghouse Scholarships. Normally, there are 50 of these scholarships, of which 10 will be vacated each year upon the graduation of the student. Each scholarship has a total value of $3,000, payable monthly at the rate of $50 for the five-year period of the course. The first 10 of the scholarships will go into effect on June 1, 1938.

Appointment will be made jointly by Carnegie Tech and Westinghouse. Applications should be made to the Manager of Technical Employment and Training, Westinghouse Electric and Mfg. Co., Union Bank Building, Pittsburgh. Students who receive scholarships will take the regular engineering course at Carnegie, and in addition will spend the summer months and two college semesters at the Westinghouse plant. The cooperative plan of study thus offers unusual opportunity for combining theoretical training with practical experience. At the age of 22 to 24, the participants will have completed a four-year formal engineering course, and at the same time, will have acquired a substantial background of approximately two years' industrial experience.

## Construction - -

### WELDED STEEL HOUSES FOR 10 PEORIA FAMILIES

A subdivision with homes all built by welders instead of carpenters was assured for Peoria with the issuance of building permits to the Letourneau Foundation for 10 all-steel houses.

The Letourneau Foundation, sponsor of the colony, is headed by R. G. Letourneau, president of the road machinery company. The first 10 homes in the subdivision, to be known as Letourneau Court, will have three rooms and a bath. They will be entirely of steel, factory made, and welded throughout.

WHITE DEER PIPE LINE CONSTRUCTION CO. has been awarded contract for approximately 30 miles of gathering lines to be used in connection with a gasoline plant to be built for the Barnsdall Oil Co. near Odessa, Texas. Twenty-seven miles of pipe from 10 in. to 20 in. diameter will be oxy-acetylene welded by the Lindeweld method.

J. F. PRITCHARD CO. has been awarded contract for approximately 22 miles of pipe line for the Continental Oil Co. The lines are from 20 in. to 4 in. diameter and will be oxy-acetylene welded by the Lindeweld method.

THE SHOCKEY BOILER & WELDING WORKS, San Diego, Calif, recently launched the first all-welded commercial fishing cruiser built in Southern California. The craft, which is one hundred per cent welded throughout, is 75 ft. long and 21 ft. wide.

THE BARNSDALL REFINING CORP. recently completed a large welding project in the construction of a $5,000,000 oil refinery at Corpus Christi, Texas.

A ONE HUNDRED PER CENT welded structural steel addition was recently built to the steel fabricating plant of ROY E. HANSON, tank builder and welding contractor, of Los Angeles. Features of the structure include double 6-in. channel sections for the supporting columns, and a five-ton traveling crane (with 22-ft. clearance) operating on a track of 10-in. beams.

PALMER STEEL HOMES, INC., of Los Angeles, recently utilized its millionth pound of steel in the construction of one of its welded steel homes. It is stated that Los Angeles County leads the nation in the number and valuation of welded steel homes, $1,500,000 having been invested in these types of homes within the past three years.

THE PETROL CORP. OF CALIFORNIA plans the early construction of 23 miles of welded pipe line to extend from the Gata Ridge oil field to a point three miles south of Point Sal. The line will be eight inches in diameter, and will transport oil to the terminal for loading tankers.

## A. W. S. Activities

NEW YORK SECTION, A. W. S. is completing plans for a series of ten lectures. The first lecture will be presented on January 11th. Details may be secured from A. W. S. headquarters, or local officers.

NEW YORK SECTION, A. W. S. at its last meeting Tuesday, December 14, 1937, held a general discussion of welding applications in shipbuilding with J. L. WILSON of the American Bureau of Shipping as presiding officer. ROBERT WEST, of Manitowoc Ship Building Corp., Manitowoc, Wis., presented a paper "Automatic Welding in Ship Construction," which covered the carbon arc process as used by his company. THOMAS M. JACKSON, of Sun Shipbuilding & Drydock Co., Chester, Pa., contributed information in regard to the Unionmelt process, during discussion of the technical paper.

MILWAUKEE SECTION, A. W. S., held a meeting on November 10th at the City Club, 756 N. Milwaukee St. KARL T. NYSTROM, production engineer, Milwaukee shops of the C. M. St. P. & P. Railroad, discussed "Welding of Streamlined Railway Cars." KARL T. NYSTROM is the son of K. F. NYSTROM, superintendent of the Milwaukee Road car department.

CLEVELAND SECTION, A. W. S., held its last meeting December 8th at Carnegie Hall, 1220 Huron Road, and ROBERT M. WALLACE, assistant superintendent of The Griscom-Russell Co., Massillon, Ohio, was the speaker of the evening. His subject was "Welding in the Heat Exchanger Industry." Incidentally, Mr. Wallace was one of the organizers of the Canton Section, A. W. S.

### DETROIT SECTION EXPANDS MEMBERSHIP AND ACTIVITY

A complete reorganization is being effected in Detroit Chapter, American Welding Society, largely due to the rapid increase in its membership within the past six months, resulting from an intensive membership drive. The annual election of officers was held November 5th, and the following men were elected: Chairman: VAUGHAN REID, City Pattern Works; Vice-Chairman: D. H. COREY, The Detroit Edison Co.; Secretary-Treasurer: H. P. DOUD, General Electric Co.

Executive Committee for 1937-38:
WALTER ANDERSON, Taylor-Winfield Company
JOE CALLEY, Murray Corp.

Executive Committee for 1937-38-39:
J. D. TEBBIN, P. R. Mallory Co.
F. E. FOOTE, Great Lakes Engineering Works.

Committee Chairmen:
Program: W. M. HAYES.
Membership: WM. H. ZORN.
Publicity: J. GESCHELIN.

The membership drive inaugurated in the past few months has doubled the membership of the section and in addition has brought to the major industries in this city a realization of the importance of welding. A number of these major industries are now taking an active interest in the membership and activities of the society, according to J. B. TEBBIN, retiring chairman.

A meeting of Detroit Section was held on November 19th, in the Alpine Room of the Detroit-Leland hotel. Mr. V. W. Whitmer of Republic Steel Corp., Youngstown, Ohio, well known metallurgical engineer, was the speaker. His subject was "Fabrication and Welding of Stainless Steel," illustrated with motion pictures.

At the December 8th meeting of the Detroit Section, held at Hotel Durant, Flint, Mich., the following speakers and subjects were on the program:

Dr. Comfort A. Adams, consulting engineer, Edward G. Budd Mfg. Co., Philadelphia, Pa. Dr. Adams spoke on "Fundamentals of Welding."

J. S. Williams, chief engineer, P. R. Mallory Co. Inc., Indianapolis, Ind. Mr. Williams discussed "Recent Developments in Resistance Welding."

This last meeting was held jointly with the Society of Automotive Engineers, as one of the technical sessions of the S. A. E. National Production Activity.

### LOS ANGELES SECTION

"Study of Stress Distribution in Welds," was the subject of a lecture at the November meeting of the Los Angeles Section of the American Welding Society. E. W. P. SMITH, electrical engineer and welding authority and instructor in the John Huntington Polytechnic Institute, at Cleveland, Ohio, was assisted in his presentation by expert technicians and special equipment. Mr. Smith's lecture was sponsored by the Lincoln Electric Co. and was illustrated by means of rubber models and polarized light, samples of which were projected on the screen. The combined experience of Mr. Smith and his technicians covers all practical applications of welding in every type of industry, as well as in the design of machinery and structures for welded fabrication.

The meeting was held on November 18th at the West Gate Masonic Temple, 1308 South New Hampshire Ave., Los Angeles. The usual 6:30 dinner and social program was dispensed with due to lack of time and the unusual character of the above described feature presented at this session. Chairman WAYNE HOWARD gave an excellent report of his visit in October to the Society's annual convention and the National Metal Exposition at Atlantic City, N. J.

### SAN JOAQUIN VALLEY SECTION

The San Joaquin Valley (Calif.) Section of the American Welding Society held its November meeting on the evening of the 18th, following a 6:30 dinner at Hotel El Tejon, in Bakersfield. HAROLD T. ETTER, manager of the Southern California Division of Air Reduction Sales Co., gave an interesting resume of the proceedings of the Society's annual convention in Atlantic City, and described some of the latest developments in the various branches of the industry. Another feature of the meeting was an interesting sound film of the Union Oil Co. of Calif. covering the construction of "Hoover Dam," perhaps more popularly known as "Boulder Dam." The picture began with the first blast of dynamite in the volcanic wall of Black Canyon, and concluded with the completed project in operation.

### SAN FRANCISCO SECTION

An interesting talk entitled "The Latest Developments in the Welding Industry," by Professor N. F. WARD, of the University of California, was the main topic of the November meeting of the San Francisco section of the American Welding Society. This meeting was held on the evening of the 19th at the Athens Athletic Club, 12th and Clay Sts., Oakland. Professor Ward attended the Society's annual meeting at Atlantic City last October, and brought back some interesting information. Another feature of the evening was the usual discussion of published articles relating to the welding industry. A 6:30 dinner preceded the meeting which was presided over by Chairman N. F. Ward.

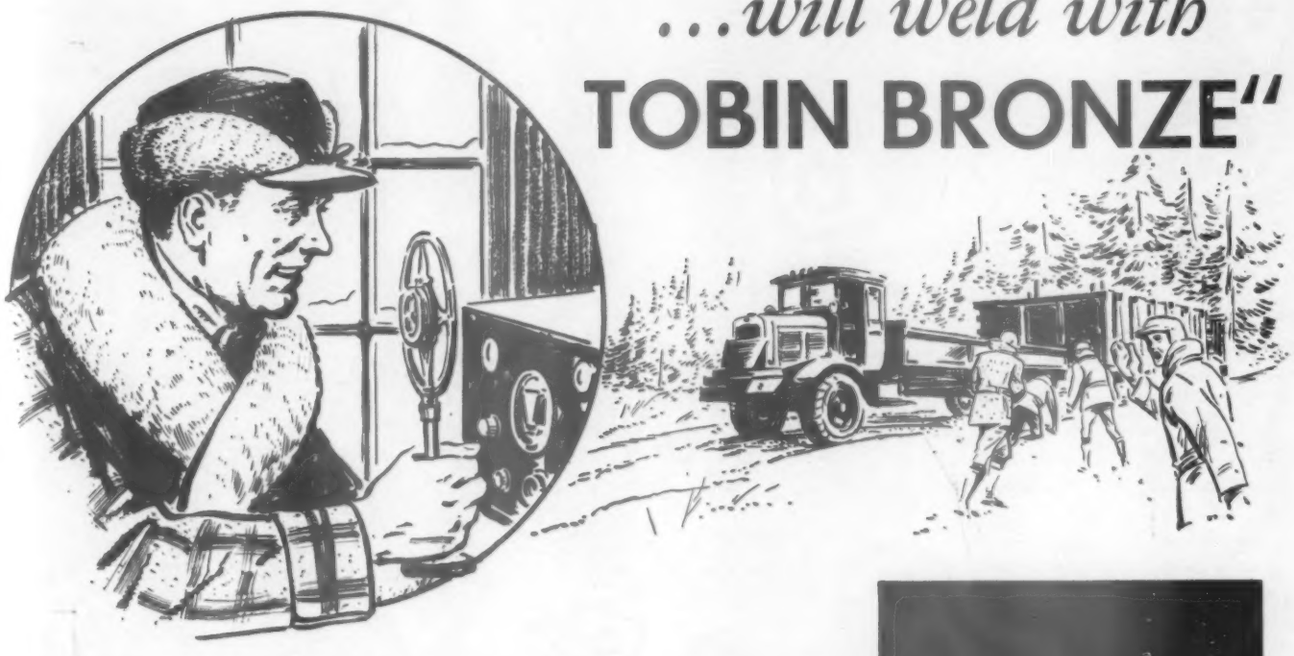
## Foreign News

### BRITAIN'S FIRST WELDED WATERLESS GASHOLDER

A number of prominent British engineers recently inspected the large Klonne waterless gasholder in the final stages of construction at the works of the Ford Motor Co., Dagenham, England. This gasholder, which has a capacity of 2,000,000 cu. ft., is notable as being the first one of welded construction in the United Kingdom. Superficially, it does not differ greatly from the riveted gasholder of the Klonne type, but closer examination shows a number of modifications in detail.

The shell is stiffened by vertical ribs and also at the horizontal plate points. The former consists of heavy joists and the latter of tee bars. The joints lie on the centers of both joists and tee bars and are butt welded from the inside, while the webs of all the members are welded to the plates at their edges, the joists having in addition widely spaced riveting.

# *"Can't wait ten days for parts ...will weld with* TOBIN BRONZE"



THE PAS LUMBER COMPANY transports its logs in Northern Canada in a way which is as unusual as it is efficient. Roads are cleared through the woods and levelled; after which huge tanks containing over 30 tons of water sprinkle the road, forming a thick coating of ice. A "rutter" cuts two parallel grooves or ruts in which the sleighs travel, sliding along easily with their log loads of 30 tons each. Huge tractors often bring in 1,000 tons on a single trip.

### *Cast-iron transfer case breaks at height of season*

Last winter, at the height of the logging season, a transfer chain brake on a big truck doubled up and pushed the side out of the cast-iron transfer case.

Short-wave communication with the head office of the Company disclosed the fact that new parts could not be obtained in less than ten days.

Ernest J. Morris, welder and Diesel engineer for the outfit, decided on a repair weld with Tobin Bronze. Preheating the case locally, as is possible with this Anaconda Rod, a strong and oil-tight repair weld soon had the truck back on the job—saving more than a week's tie-up of the logging operations.

This is another instance proving the value of Tobin Bronze for difficult jobs on cast and malleable iron. Experienced welders know that this Anaconda Welding Rod enables the welder to do "impossible" jobs. It flows freely, enabling the welder to weld very rapidly. Ductility and strength, say well-known welders, exceed that of any other rod manufactured for a similar purpose.

Tobin Bronze carries the trade-mark "Tobin Bronze Reg. U. S. Pat. Off." in each rod . . . Look for this trade-mark and be sure you are getting the genuine.

*The Tobin Bronze weld which saved at least a week's tie-up*

ANACONDA

# *Anaconda Welding Rods*

THE AMERICAN BRASS COMPANY, General Offices: WATERBURY, CONNECTICUT

*Offices and Agencies in Principal Cities* • In Canada: ANACONDA AMERICAN BRASS LTD., New Toronto Ont.

The height measured from the bottom edge of the lowest strake to the top gallery is 185 ft. 3 in., and the diameter is 126 ft. The internal surface is cylindrical and, as the internal welds have been ground flush with the plate, is also very smooth. One of the modifications in design is a new form of piston packing which does not employ a liquid seal. The quality of the seal provided by it is evidenced by the fact that the piston was used in erection, this procedure being followed as the shell was extended upwards, the piston being supported on compressed air. There are four railed galleries, not counting the top roof gallery. They are reached by stairways of easy gradient and an external elevator to the roof.

A CONFERENCE of the International Carbide Cartel took place in Paris early in November, the meeting held in Vienna in October having failed to lead to an agreement on the extension of the duration of the cartel arrangements, which are due to expire on March 31, 1938. The Paris conference also failed to lead to an agreement and further negotiations in the near future are contemplated.


# ADAMS
## VERTICAL WELDERS
### Have Proven Superior Performance by Use in Numerous Industries

**Many have given equivalent to 12 years normal service with complete satisfaction.**

**We invite you to investigate "ADAMS VERTICALS" —machines developed on one of the largest welding floors operated by any manufacturer of welding equipment.**

**A unique electrical circuit (patents pending) coupled with rigid construction and single dial control are features you will find advisable to test before your next purchase.**

**Write for details and trial offer on either D.C. or A.C. (high frequency) types.**

*Adams Vertical Welders are made in D.C. and A.C. (high frequency) models in various sizes. The Adams line also includes engine-driven welders, generators, welding supplies, and a complete assortment of electrodes for mild steel, stainless steel, manganese steel and aluminum.*

**J. D. ADAMS COMPANY - INDIANAPOLIS, IND.**
WELDING DIVISION


### LLOYD'S REGISTER SURVEYS ADVANCE OF WELDING

An interesting paragraph on the progress of welding in the shipbuilding industry is contained in the annual report of Lloyd's Register of Shipping for the year ended June 30, 1937, just issued in London.

According to the report, the use of welding is now finding its most important application in the construction of tankers, although it is also being extensively employed in both passenger and general cargo ships for parts of a hull structure which are not of primary importance from the strength point of view.

Two tankers, each 500 ft. in length, are now in use in which welding is exclusively used in the hull construction and in another tanker, 521 ft. in length, just launched in the United States, the structure was welded throughout. Engine framing, and pressure vessels also afford instances of the applicability of welding to shipbuilding.

### BRITAIN'S FIRST WELDED BRIDGE

The London Passenger Transport Board, which controls all passenger transport facilities in the British metropolis, has placed a contract for the construction of a new bridge to carry the Hammersmith and City Railway over Ladbroke Grove, just outside Ladbroke Grove depot. The new bridge is to be of all-welded construction, and will be the first of its type and size in the United Kingdom.

### WELDING REPAIRS GAINING FAVOR

The increased intensity of the traffic on many European railroads during the past few years, coupled with the tendency to adopt progressively heavier rolling stock, has led to more rapid wear in service, and greater use of methods to restore the original contour of worn parts. This method has recently been investigated by the Societe L'Air Liquide, Paris, which concern has issued a report on the subject.

The report contains details of the process employed for building up worn rails, and also some data on the weld metal advocated. This metal, to which the name "Altor" has been given, is an alloy steel low in carbon, but containing chromium, manganese and other added elements which, it is claimed, impart to the finished deposit a Brinell hardness of from 280 to 300. It is

also claimed that this weld metal does not readily oxidize and bonds easily with the rail steel, forming a non-porous deposit free of blow-holes and having a regular crystal structure.

When building up a worn rail, all deformed and worn metal is cut away by means of a chisel or removed by melting with the aid of the oxygen blowpipe. The surface of the rail steel is then melted and the welding rod metal deposited in thin layers either transversely or longitudinally, according to the length of rail under repair, until the required thickness is obtained. Finally, the deposit is hammered while maintained at a forging heat of 800 to 1,200 deg. C.

This hammering is carried out in two stages, in the first stage light blows are given to the deposit using a hammer weighing about 19½ oz. This treatment refines the grain of the deposit. The object of the final hammering, which is carried by using a 8¾ to 11-lb. hammer, in conjunction with a "flatter," is to give the deposit a uniformly smooth surface and to restore the rail as nearly as possible to its original contour. During the building-up process, earth is thrown on the wooden tie beneath the rail to protect it from the heat of the blowpipe flame.

The use of this process is steadily spreading in Europe. In Poland it has been in use for several years, while in Portugal the railroad authorities have adopted it and carried out a number of repairs to their tracks. Experiments are also being conducted in several other countries, including Italy, Belgium and Luxembourg.

## Trade News

J. W. DUNBAR, formerly in charge of magazine advertising for the Incandescent Lamp Department of the General Electric Co., at Nela Park, Cleveland, has been appointed assistant to CHESTER H. LANG, advertising manager of the General Electric Co. Mr. Dunbar's headquarters will be at 570 Lexington Ave., New York City, where he will devote his principal attention to the selection of media.

ELECTRIC HOSE & RUBBER CO. has opened a new and larger Eastern sales office at Room 919, Nine Rockefeller Plaza, New York City. The new office will serve as headquarters for A. B. DOUGALL, general sales manager of the company, and D. C. SMALLEY, manager of metropolitan sales division.

MILES C. SMITH, who has been in charge of the sales and marketing of Colomonoy products for the past 2½ years, has resigned from Colmonoy Inc. to direct the sales promotion and sales of Amercoat. This product is a new corrosion-resistant sprayable plastic that has been under test for more than two years. It is a product of the laboratories of American Concrete and Steel Pipe Co. of Los Angeles, Calif.

FELIX KWAST, connected with the engineering department of the Kimball-Krogh Pump Division of Victor Equipment Co. for the past year, has been appointed chief engineer with headquarters at the Los Angeles plant and hydraulic laboratory.

Mr. Kwast brings to this position a wealth of training and experience and during the past twelve months developed and perfected several new Victor-Kimball-Krogh pump designs. Graduated in hydraulic engineering at the University of Darmstadt, Germany—he came to this country over a quarter of a century ago, and his first two years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WELDING CABLE

● **The ideal welding cable must be flexible, must stand abuse and be perfectly insulated.**

**Okocord Welding Cable embodies these three attributes. It is extremely flexible, because the conductor is made of a great many fine copper wires. It withstands mechanical abuse because it is made with a jacket of tough, tire-tread type of 60% rubber. It has perfect insulation because it is insulated by The Okonite Company—an acknowledged leader in the insulation field since 1878.**

**For long trouble-free service, use Okocord Welding Cable.**

THE OKONITE COMPANY

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THE OKONITE-CALLENDER CABLE COMPANY, INC.

EXECUTIVE OFFICE: PASSAIC, N. J.

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Factories: Passaic, N. J., Wilkes-Barre, Pa., Paterson, N. J.

were spent as the pump designer for the Dow Pump & Engine Co. at San Francisco. He then spent another year in the same capacity, with the Yuba Construction Co. at Marysville, Calif.—followed by 18½ years in the position of hydraulic engineer for the Byron-Jackson Co. at Berkeley and two years as chief engineer of Sterling Pump Co., Stockton, Calif.

With such a broad background in hydraulics, designing and engineering, Mr. Kwast's experience qualifies him to disseminate needed information to all Victor-Kimball-Krogh sales engineers, distributors and pump users.

THOMPSON MACHINE AND WELDING SUPPLY CO., Danville, Ill., has just recently been organized to handle the distribution of Airco oxygen and acetylene, Airco welding apparatus and Wilson arc welders. This concern was formerly known as the Thompson Machine and Welding Co. The following are members of the firm: ROY L. THOMPSON, H. E. MENAFEE, L. R. MARTIN.

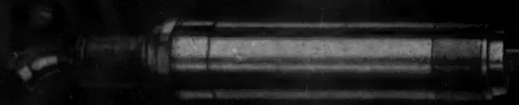

CLECO

B1 SCALING TOOL

Ideal for Peining Bead When You Want a Smooth Finished Job

Here is a scaling tool that is new—different—better. The handiest thing yet for peining bead when you want a smooth finished job; for cleaning off weld splatter; for undercutting when overlapping is necessary. Cleans off rust, scale and old paint like nobody's business. Exactly the power and speed you want by pressing handle easy or hard. Swivel air connection prevents twisted hose. Chisel can't loosen or turn, yet releases at a touch. Exhaust blows chips and scale off work.

*Let us demonstrate a CLECO B1 on your work. No obligation. Bulletin 84 is worth having. Send for it.*



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## Trade Literature

"THE CONTOUR MACHINING HANDBOOK" is the title of the revised edition of an earlier handbook on contour sawing issued by Continental Machine Specialties, Inc., Minneapolis, Minn. Among the new subjects covered in this handbook are the elimination of machining strains by correct sawing technique, the wider variable speed range now possible, the simple butt welding of the precision narrow saws for internal cutting and additional illustrations and case records dealing with unusual contour machining jobs. A chapter is included on the construction of welded jigs and fixtures from hot rolled steel shapes and tool steels. Advantages of welded jigs over cast iron and cast steel jigs are clearly indicated. Copies of this handbook may be secured by writing to the Continental Machine Specialties Inc., 1301 Washington Ave., South, Minneapolis, Minn.

VANADIUM IN CAST IRON, a new 28-page booklet just issued by the Vanadium Corporation of America, describes the improved physical properties of cast irons employing varying amounts of vanadium. Numerous charts and tables list the specifications of various vanadium-containing irons, and a number of commercial applications of vanadium irons are illustrated.

Compositions of established use are discussed, among which are nickel-vanadium iron, nickel-chromium-vanadium iron, nickel-molybdenum-vanadium iron, titanium-vanadium iron and chromium-vanadium iron. For copies of this booklet, write the Vanadium Corporation of America, 420 Lexington Ave., New York.

INDUSTRIAL LIGHTING EQUIPMENT—Just off the press, the newly revised edition of Benjamin Catalog No. 26 includes data on the latest improvements and lighting developments of the past year. An encyclopedia of industrial lighting, flood lighting and signals—it is packed full of vital information.

This 352 page, loose-leaf book, details specifications, engineering recommendations, floor layout plans, intensity formulae, cost and labor-saving hints, lighting efficiency curves and installation views.

"WHAT IS SINGLE CURRENT CONTROL?" is the title of a new book showing how single current control is used in the Hansen Smootharc welding generators. F. J. Hirner of the Welder Division of the Harnischfeger Corp., Milwaukee, Wis., is the author. A complete explanation of K. L. Hansen's self-excited, internally-stabilized Smootharc welding generator, it is interestingly and clearly written. The book should be of value to anyone connected with welders and their use in industry. Copies of this folder may be obtained by writing the Harnischfeger Corp., 4400 W. National Ave., Milwaukee, Wis.

BULLETIN 920-A on remote control switches has just been issued by Automatic Switch Co., 154 Grand St., New York City. It is profusely illustrated with drawings and photographs showing details of operations, advantages, etc. A copy will be sent to anyone writing to the Automatic Switch Co.

"BARNES HACK SAW BLADES" is the subject of a small booklet just issued by W. O. Barnes Co., Inc., Detroit, Michigan. It is really a manual of metal cutting information designed to be of maximum benefit to the man in the shop, who has to use hand-operated or power-operated hack saws.

"NATIONAL FLAME HARDENING" is the subject of a small folder just issued by the National Cylinder Gas Co., Chicago. This bulletin focuses attention on the flame hardening equipment of this company as adapted for improving the surface wear resistance of steel.

PRATT & WHITNEY, Hartford, Conn., have just issued an attractive booklet "Controlled Strip Thickness." This book describes the Electrolimit mill gage, known to mill men as the "flying mike." This device, it is claimed, has eliminated the human element in measuring strip thickness.

"BETHLEHEM OPEN-WEB STEEL JOISTS" is the title of a new booklet just issued by the Bethlehem Steel Company, Bethlehem, Pa. It describes two types of open-web steel joists, such as have been adopted by the building industry. First is described the Bethlehem welded joist and next


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BRAZING ALLOYS "DIG IN"

Those who have never seen it before are amazed at the action of brazing alloys containing a percentage of silver —

*First* — by the extreme fluidity at temperatures as low as 1175° F.

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These are not only interesting, but important facts, if you accept the evidence of thousands of manufacturers in all lines of industry who are getting *better* joints with silver brazing alloys at a net *reduction* in cost.

If you have ferrous or non-ferrous metals to join, try the low temperature brazing alloys — SIL-FOS and EASY-FLO — Use the low temperature HANDY FLUX with them. You can profit from the reliable joints they make in fast time with savings in gas, labor and finishing costs — Write us for details.

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BRIDGEPORT, CONN. PROVIDENCE, R. I. TORONTO, CANADA

the Bethlehem expanded open-web joist. It is stated that these joists are well suited for light-occupancy structures, such as hospitals, apartments, schools, offices and residences. The booklet should interest any engineer interested in welding of building structures.

— —

"MACHINING ALUMINUM" is the title of a new booklet issued by Aluminum Company of America, Pittsburgh, Pa. Detail data is included on the machining of aluminum and its alloys. Space is devoted to cutting angles and shapes for various tools in machine shop practice. The booklet also discusses cutting speeds, feed, lubricants and tool materials. A copy will be sent to anyone addressing their request to Aluminum Company of America, Pittsburgh, Pa.

— —

"CHASE OLYMPIC BRONZ" is the title of a profusely illustrated educational booklet just issued by Chase Brass and Copper Co., Waterbury, Conn. Olympic Bronze is a silicon bronze designed especially for structural and engineering purposes. The booklet covers the fabrication properties and welding technique to employ with Chase Olympic Bronze. This latter section is illustrated with sketches of different types of welded connections and contains considerable technical data on carbon arc and oxy-acetylene welding of Olympic Bronze.


**Ryerson a dependable source for Welding Rod**

● Ryerson Engineers have developed a series of rods that are outstanding for Quality production. More than twenty types, including both electric and gas rods, are carried in stock. Whether you need a shielded arc type for production work or a stainless steel rod you can be sure of immediate shipment... *Write for Bulletin which gives complete data.*

**ELECTRODES**

**Ryerson**
Shielded Arc Type No. 215
Shielded Arc Type No. 216
Shielded Arc Type No. 217
Green Processed No. 18
Copper Coated No. 206
Copper Coated No. 210
Cast Iron

**Ryerson**
Green Processed No. 6
Bare Mild Steel
Brown Processed
White Flux Coated
High Carbon White Flux Coated
Blue Flux Coated

**GAS RODS**

3½% Nickel Steel
High Carbon Bare No. 2110

**Ryerson**
3½% Nickel Steel Flux Coated
High Manganese Steel
Hard Surfacing
Allegheny Stainless Flux Coated
Allegheny Stainless No. 44

Tobin Bronze
Allegheny Stainless Bare
Hard Filler

JOSEPH T. RYERSON & SON, Inc., Chicago, Milwaukee, St. Louis, Detroit, Cleveland, Cincinnati, Buffalo, Boston, Philadelphia, Jersey City


GEORGE W. HETTRICK, owner of the Anchor Welding Service, 4715 W. Chicago Ave., Chicago, Ill., passed away at his home November 16, 1937. Mr. Hettrick entered the welding field in 1913 as service engineer with the then Oxweld Acetylene Co., in Chicago. After 10 years service he left to organize his own business on Chicago Ave. in 1923. After a year the growth of his business was such that larger quarters were necessary and the present quarters were built.

GEORGE W. HETTRICK

Always a strong proponent of sound welding practice, Mr. Hettrick had built an enviable reputation for himself and his business and in this way he helped in no small measure to advance the acceptance of welded construction and repair. His many friends in the industry will regret to hear of his passing. He is survived by his wife, Elsie Hettrick and one son, George. He was member of Humboldt Park Commandery, No. 79, K. T.; Austin Lodge, No. 850, A. F. & A. M.; Laurel Chapter, No. 270, R. A. M.; and Medinah Temple.

*Large File Area*

**The "Round File" construction provides a very large file area—approximately one square inch. This assures longer life for the lighter. The file is of superior quality and can be easily replaced.**

**Many superior design and construction features combine to make the Improved "Round File" the most economical and efficient lighter on the market.**

**Get acquainted with Improved "Round File" and its many advantages. Descriptive folder and prices on request.**

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